SOIL SURVEY OF

Wheeler County, Texas

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Texas Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1960–68. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1970. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Wheeler County Soil and Water Conservation District.

Copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Wheeler County are shown on the detailed map at the back of this survey. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit and range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the range sites and capability units.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Ranchers and others can find, under "Range Management," groupings of the soils according to their suitability for range and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Engineering Uses of the Soils."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain estimates of soil properties and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Wheeler County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication and in the section "General Nature of the County."

Cover: Pond on spring-fed creek in an area of range. In foreground is Grandfield loamy fine sand, 0 to 3 percent slopes.

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SOIL SURVEY OF WHEELER COUNTY, TEXAS

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE,
IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

WHEELER COUNTY is in the northwestern part of Texas (fig. 1). It has a total area of 592,000 acres, or 925 square miles. Wheeler is the county seat.

This county is nearly all in the Rolling Plains section of the Southern Great Plains. About 500 acres in the northwestern corner of the county is a part of the High Plains. The soils are mostly gently sloping to sloping. They are used mostly for range and crops.

Agriculture is of prime importance in the county. Most of the acreage is used for range. About 121,000 acres is used for dryland farming, and 14,000 acres is irrigated. Cotton, grain sorghum, and wheat are the main cash crops. Wheeler is the peach capital of the Texas Panhandle. Cattle are the principal livestock. The climate of Wheeler County has periods of drought and high winds.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Wheeler County, where they are located, and how they can be used. They went into the county expecting to find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

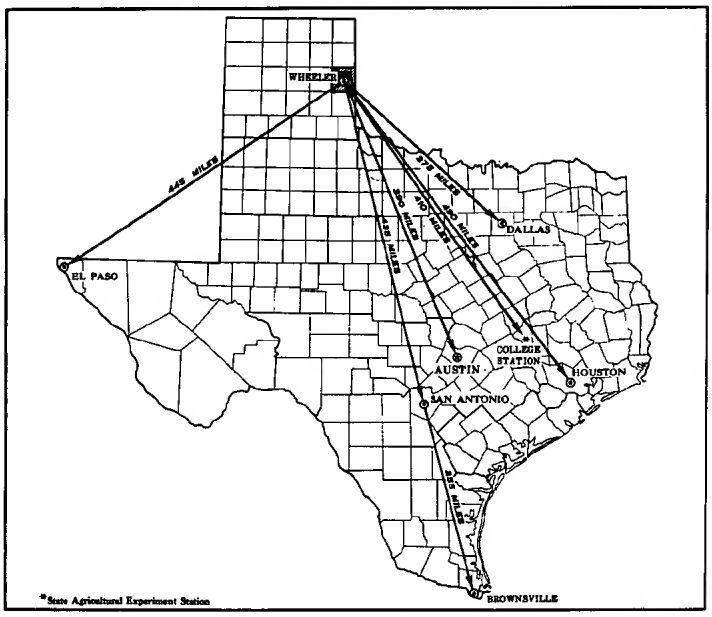

Figure 1.—Location of Wheeler County in Texas.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The soil series and the soil phase are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Abilene and Grandfield, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Grandfield fine sandy loam, 0 to 1 percent slopes, is one of several phases within the Grandfield series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not

exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Wheeler County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Blown-out land-Tivoli complex is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Berda and Potter soils, rolling, is an undifferentiated soil group in this county.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Rough broken land is a land type in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil, and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Wheeler County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or other structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this county are described in the following paragraphs. The terms for textures used in the title for several of the associations apply to the texture of the surface layer of the major soils. For example, in the title of association 1, the words, "loamy fine sands" refer to the texture of the surface layer of the Grandfield and Devol soils.

Soil associations and delineations on the general soil map in this soil survey do not fully agree with those on the general soil maps of adjacent counties published at a different date. Differences in the maps are the result of improvements in the classifications or refinements in soil series concepts.

1. Grandfield-Devol association

Deep, nearly level to gently sloping loamy fine sands

This association consists of nearly level to gently sloping soils. These soils are on undulating plains that are dissected by a few creeks and drainageways (fig. 2).

This association makes up about 39 percent of the county. It is about 42 percent Grandfield loamy fine sands and 24 percent Devol loamy fine sands. The remaining 34 percent is Bippus, Carey, Cobb, Delwin, Guadalupe, Hardeman, Likes, Lincoln, Lutie, Mansker, Mobeetie, Portales, Potter, Pratt, Quinlan, Sweetwater, and Tipton soils and Grandfield fine sandy loams.

Grandfield loamy fine sands have a brown surface layer about 15 inches thick. The next layer is reddish-brown sandy clay loam in the upper 25 inches and reddish-yellow sandy clay loam in the lower 14 inches. The underlying material is reddish-yellow loamy fine sand that extends to a depth of 80 inches.

Devol loamy fine sands have a brown surface layer

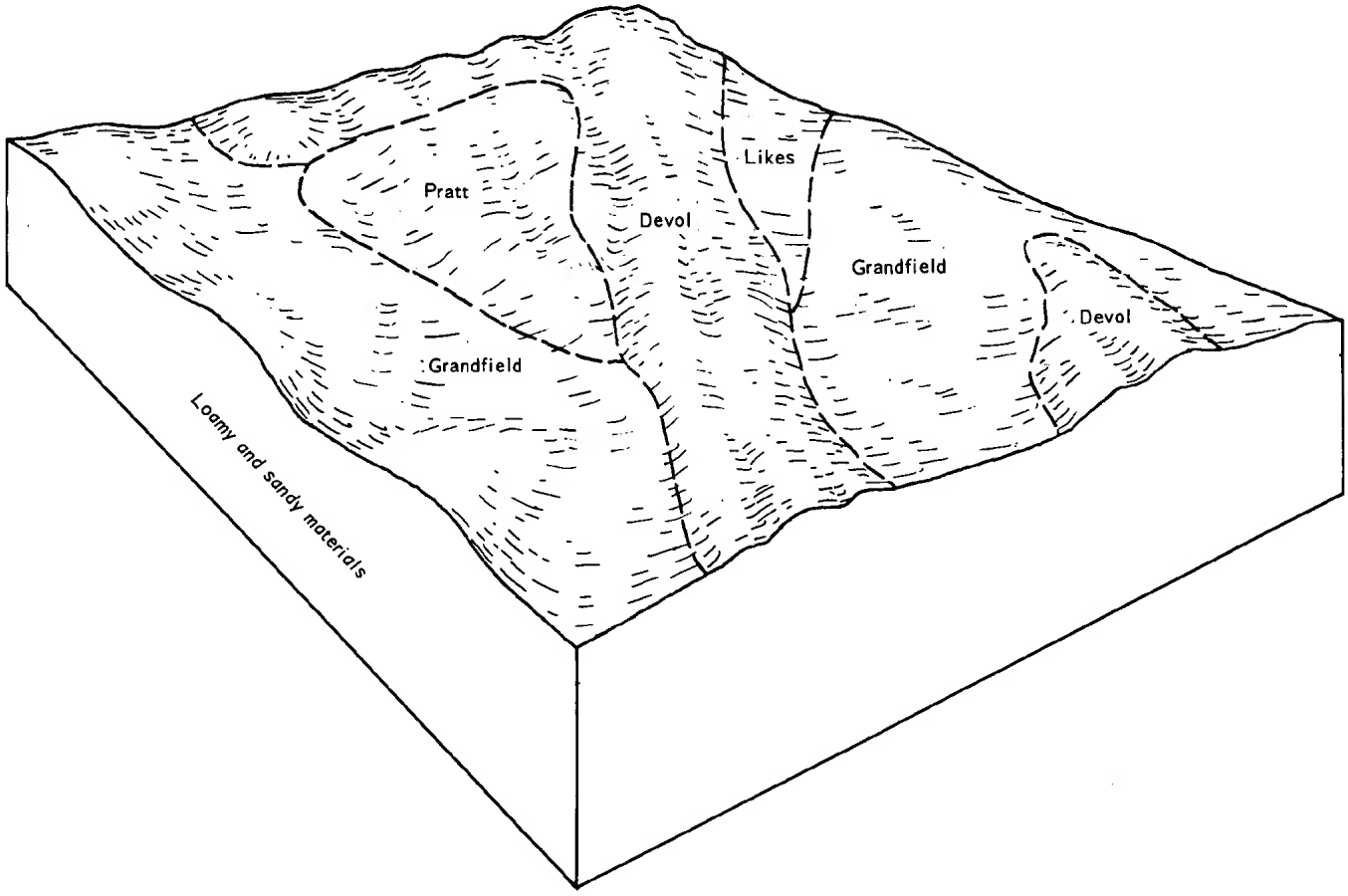

Figure 2.—**Relationship of soils in the Grandfield-Devol association to parent material and relief.**

about 16 inches thick. The next layer is reddish-brown fine sandy loam in the upper 9 inches and brown loamy fine sand in the lower 13 inches. The underlying material is reddish-yellow loamy sand that extends to a depth of 86 inches.

About half of this association is used for crops, and half is range. Soil blowing is the main hazard on the soils of this association.

2. *Devol-Tivoli association*

Deep, gently sloping to steep loamy fine sands and fine sands

This association consists of gently sloping to steep soils that have an undulating to duned appearance (fig. 3). The drainage pattern is poorly defined.

This association makes up about 20 percent of the county. It is about 50 percent Devol soils and 20 percent Tivoli soils. The remaining 30 percent is Delwin, Grandfield, Guadalupe, Likes, Lincoln, Lutie, Mobeetie, Pratt, Quinlan, and Sweetwater soils, Blown-out land, and Rough broken land.

Devol soils have a surface layer of brown loamy fine sand about 16 inches thick. The next layer is reddish-brown fine sandy loam in the upper 9 inches and strong-brown loamy fine sand in the lower 13 inches. The underlying material is reddish-yellow loamy sand that extends to a depth of 86 inches.

Tivoli soils have a surface layer of pale-brown fine sand about 8 inches thick. The underlying material is reddish-yellow fine sand.

Most of this association is range. A few areas were cultivated at one time but have now been abandoned. These soils are not suited to crops. Good management is needed in range areas to maintain an adequate protective cover of grasses that keep the soils from blowing.

3. *Pratt-Delwin association*

Deep, nearly level to gently sloping fine sands

This association consists of nearly level to gently sloping soils. The surface appears undulating (fig. 4), and the drainage pattern is poorly defined.

This association makes up about 14 percent of the county. It is about 56 percent Pratt soils and 31 percent Delwin soils. The remaining 13 percent is Devol, Grandfield, Lincoln, Sweetwater, and Tivoli soils.

Pratt soils have a surface layer of grayish-brown fine sand about 4 inches thick. The next layer is very

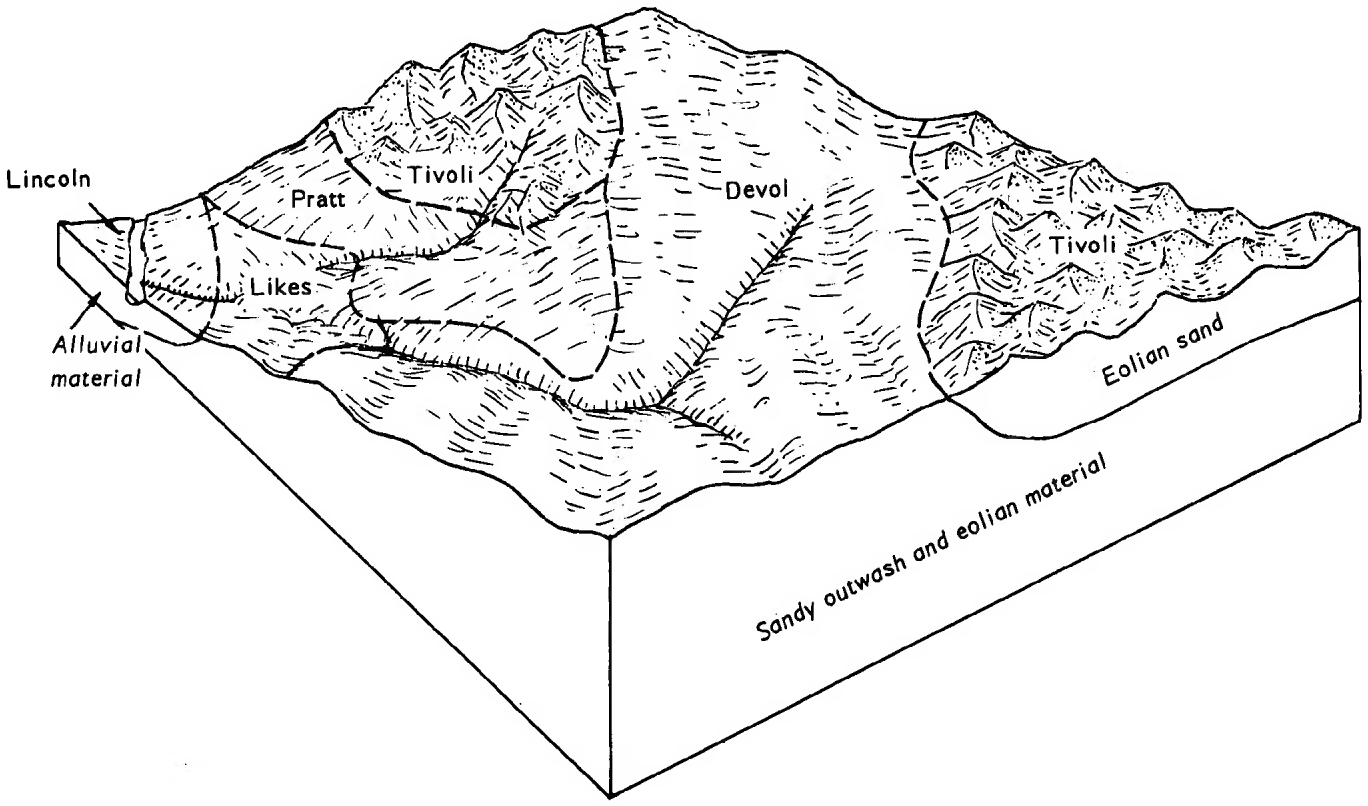

Figure 3.—**Relationship of soils in the Devol-Tivoli association to parent material and relief.**

pale brown fine sand in the upper 21 inches and reddish-yellow loamy sand in the lower 35 inches. The lower part contains thin bands of yellowish-red sandy loam. The underlying material is yellow loamy sand that extends to a depth of 86 inches.

Delwin soils have a surface layer of fine sand about 16 inches thick. The upper 5 inches of this layer is light brownish-gray, and the lower 11 inches is brown. The next layer is about 16 inches of reddish-brown sandy clay loam. This is underlain by yellowish-red sandy clay loam that extends to a depth of 80 inches.

Most of this association is range. A few areas of Delwin soils are used for crops. Soil blowing is the main hazard on the soils of this association, and management is needed that keeps the surface layer from blowing.

4. Lutie-Obaro-Quinlan association

Deep to shallow, gently sloping and rolling silt loams

This association consists of gently sloping and rolling soils that occur in areas cut by numerous creeks or drainageways.

The association makes up about 14 percent of the county. It is about 27 percent Lutie soils, 25 percent Obaro soils, and 15 percent Quinlan soils. The remaining 33 percent is Carey, Clairemont, Cottonwood, Dodson, and Paducah soils, Gypsum outcrop, and Rough broken land.

Lutie soils have a surface layer of reddish-brown, calcareous silt loam about 11 inches thick. The next layer is reddish-brown silty clay loam in the upper 5 inches. Below this it is red silty clay loam and silt loam that extends to a depth of more than 60 inches.

Obaro soils have a surface layer of reddish-brown silt loam about 8 inches thick. The next layer is yellowish-red silt loam in the upper 13 inches and light reddish-brown silt loam in the lower 10 inches. The underlying material is red sandstone that extends to a depth of 65 inches.

Quinlan soils have a surface layer of light reddish-brown silt loam about 15 inches thick. The underlying material is a light-red, weakly cemented sandstone.

Most areas of this association are used for range, but a few areas are used for crops. Good management is needed to help control soil and water losses.

5. Grandfield-Hardeman association

Deep, nearly level to sloping fine sandy loams

This association consists of nearly level to sloping soils on plains, ridges, and side slopes. The surface appears undulating (fig. 5).

This association makes up about 7 percent of the county. It is about 50 percent Grandfield fine sandy loams and 17 percent Hardeman fine sandy loams. The remaining 33 percent is Abilene, Altus, Berda, Bippus, Devol, Gageby, Guadalupe, Lincoln, Mansker,

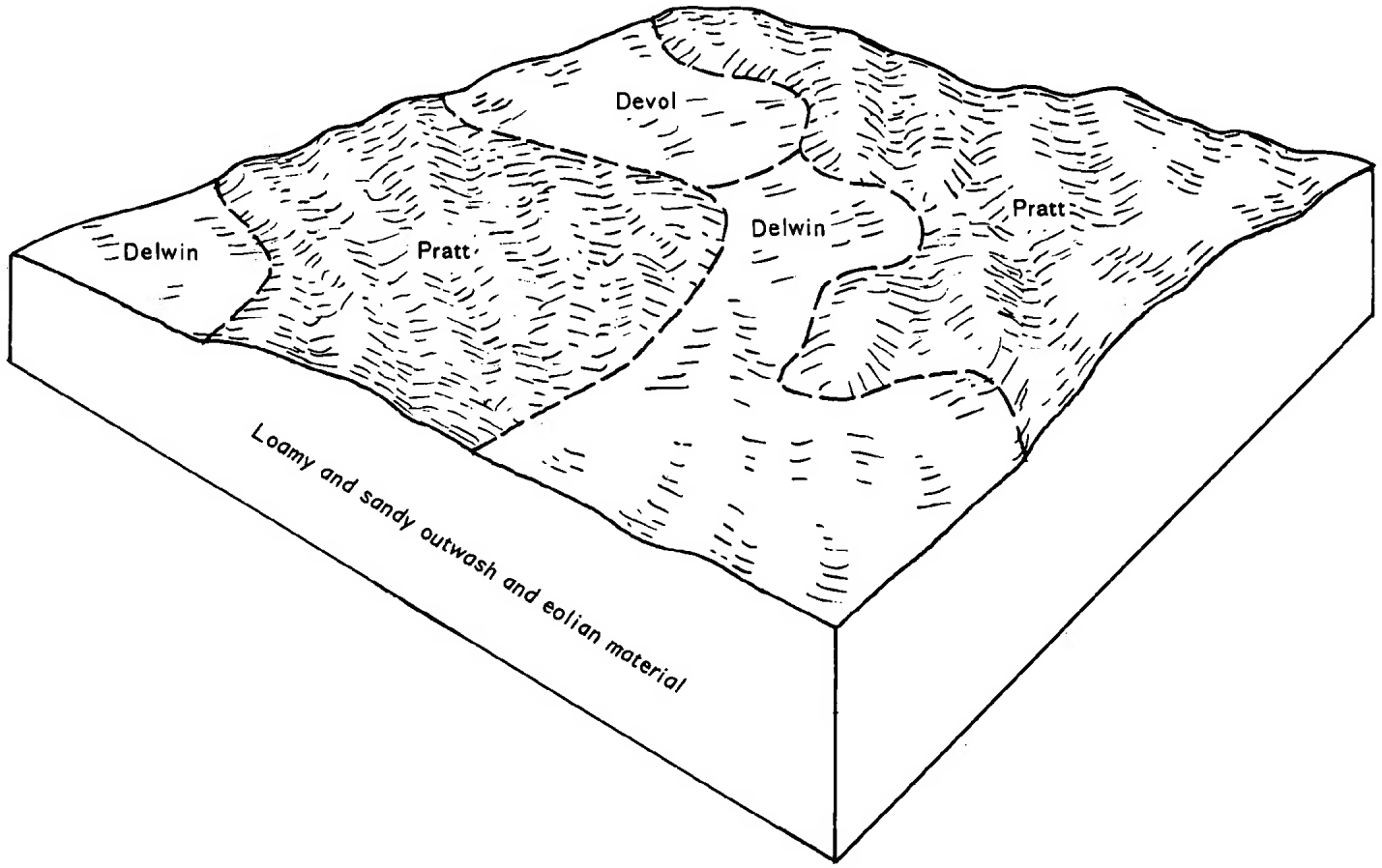

***Figure 4.*—Relationship of soils in the Pratt-Delwin association to parent material and relief.**

Mobeetie, Potter, and Veal soils and Grandfield loamy fine sands.

Grandfield fine sandy loams have a brown surface layer about 8 inches thick. The next layer is reddish-brown sandy clay loam in the upper 30 inches and reddish-brown fine sandy loam in the lower 22 inches. The underlying material is reddish-yellow fine sandy loam in the upper 8 inches and reddish-yellow loamy sand in the lower 12 inches.

Hardeman fine sandy loams have a brown surface layer about 8 inches thick. The next layer is brown fine sandy loam in the upper 16 inches and light-brown fine sandy loam in the lower 24 inches. The underlying material is pink loamy fine sand.

Most of this association is used for crops. A few areas are in range. Soil blowing is a hazard on all the soils, and water erosion is a hazard on the more sloping soils.

6. *Abilene-Mobeetie-Berda association*

Deep, nearly level to sloping and rolling clay loams, loams, and fine sandy loams

This association consists of nearly level to sloping and rolling soils on erosional plains, hills, and ridges and in valleys (fig. 6).

This association makes up about 6 percent of the county. It is about 23 percent Abilene soils, 19 percent Mobeetie soils, and 15 percent Berda soils. The remaining 43 percent is Bippus, Gageby, Guadalupe, Mansker, Portales, Potter, Pullman, Tipton, and Veal soils.

Abilene soils have a surface layer of dark-brown clay loam about 8 inches thick. The next layer is dark-brown clay loam in the upper 14 inches, brown and light-brown clay loam in the next 34 inches, and pink clay loam in the lower 18 inches. The underlying material is light-brown clay loam.

Mobeetie soils have a surface layer of grayish-brown fine sandy loam about 9 inches thick. The next layer is brown fine sandy loam in the upper 13 inches and very pale brown fine sandy loam in the lower 14 inches. The underlying material is pink loamy fine sand.

Berda soils have a surface layer of grayish-brown loam about 11 inches thick. The next layer is brown loam in the upper 15 inches and light yellowish-brown loam in the lower 16 inches. The underlying material is pink loam that extends to a depth of 60 inches.

The nearly level to gently sloping soils in this association are used mostly for crops. The rest of the association is used for range. Water erosion and soil blowing are hazards.

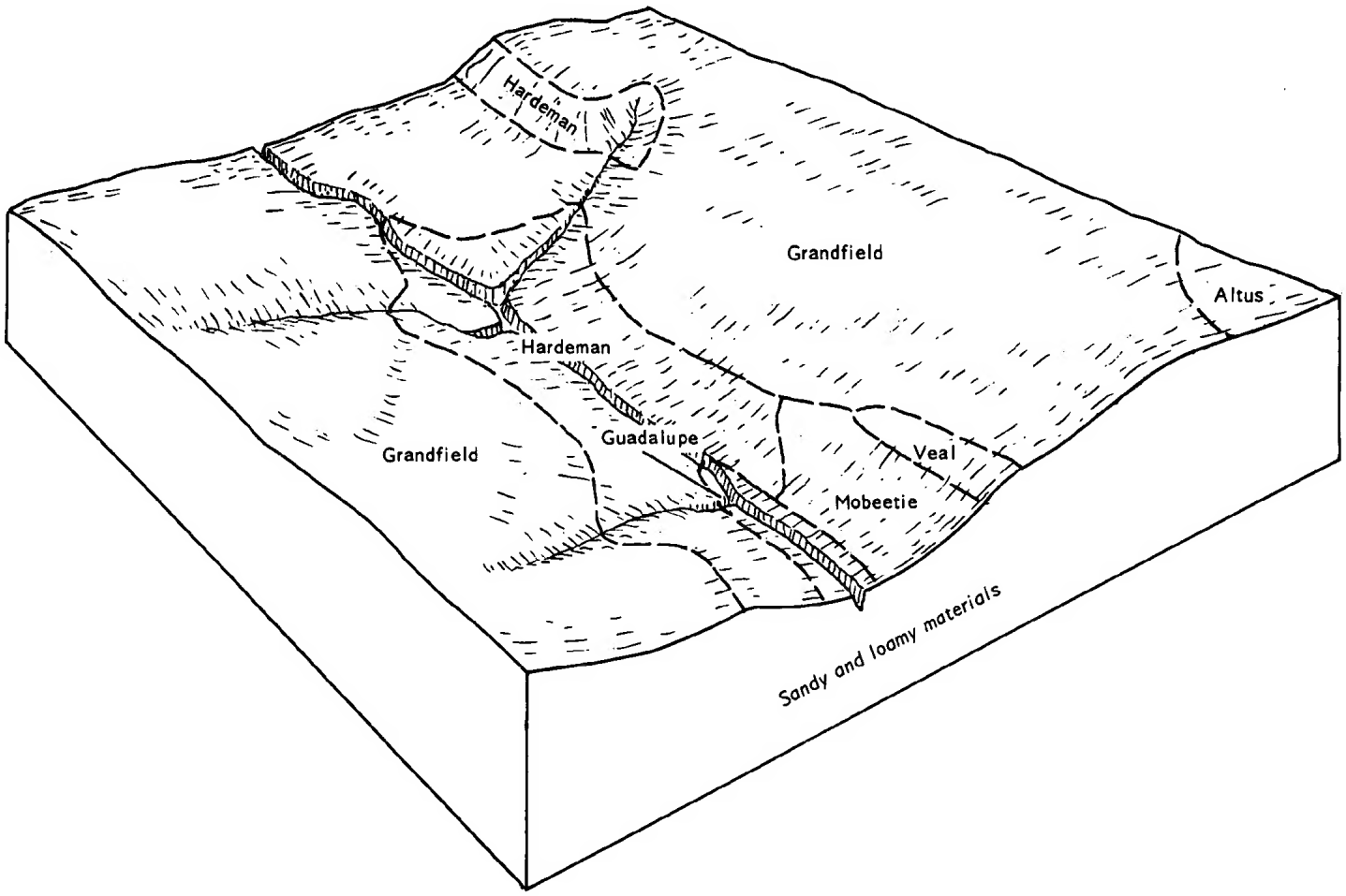

Figure 5.—**Relationship of soils in the Grandfield-Hardeman association to parent material and relief.**

Descriptions of the Soils

This section describes the soil series and mapping units of Wheeler County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for dry soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rough broken land, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and the range site in which the mapping unit has been placed. The page for the description of each capability unit and each range site can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual.[1]

[1] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus. 1951.

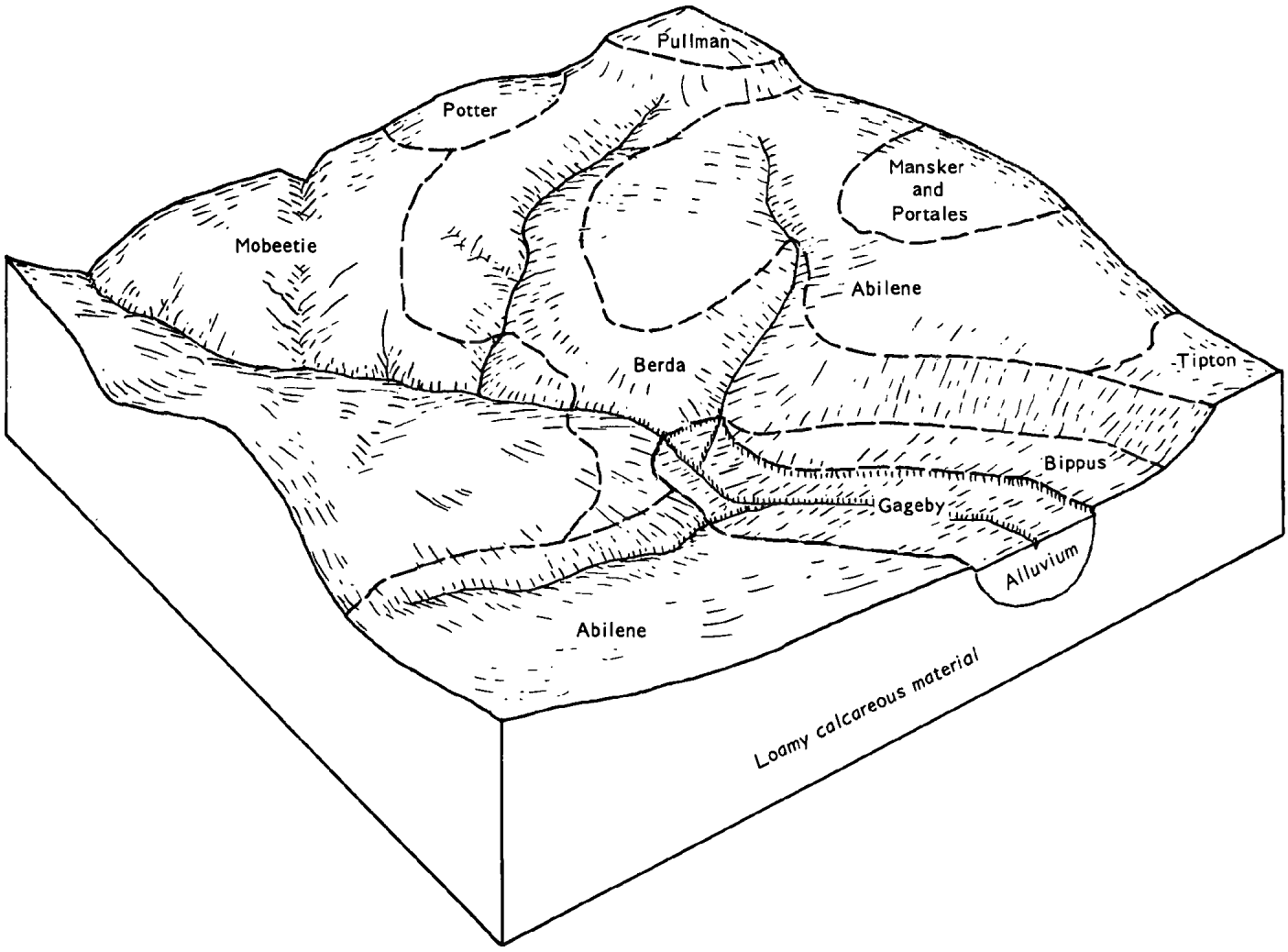

Figure 6.—**Relationship of soils in the Abilene-Mobeetie-Berda association to parent material and relief.**

Abilene Series

The Abilene series consists of deep, moderately slowly permeable soils on uplands. These soils formed in calcareous, loamy sediment.

These soils (fig. 7) typically have a surface layer of dark-brown clay loam about 8 inches thick. The next layer is dark-brown clay loam in the upper 14 inches; brown and light-brown, calcareous clay loam in the next 34 inches; and pink clay loam in the lower 18 inches. The lower part is about 35 percent calcium carbonate. The underlying material is light-brown, calcareous clay loam.

Abilene soils are well drained and have high available water capacity.

Typical profile of Abilene clay loam, 1 to 3 percent slopes, 4.5 miles northeast on Farm Road 1046 from its junction with Farm Road 48 in New Mobeetie, then 3.4 miles north on a county road, then 50 feet west in a cultivated field:

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/3) moist; weak, very fine, subangular blocky structure; hard, friable; few worm casts; neutral; clear, smooth boundary.

B1—8 to 12 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate, fine and very fine, subangular blocky structure; very hard, friable; few fine pores; few worm casts; neutral; clear, smooth boundary.

B21t—12 to 22 inches, dark-brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) moist; moderate, medium, blocky structure; very hard, firm; few very fine pores; few clay films; few very fine ferrous manganese concretions; mildly alkaline; gradual, smooth boundary.

B22t—22 to 40 inches, brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak, coarse, prismatic structure parting to moderate, medium, subangular blocky; very hard, firm; common clay films; few very fine calcium carbonate concretions; calcareous; moderately alkaline; gradual, smooth boundary.

B23t—40 to 56 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate, medium, subangular blocky structure; hard, friable; few clay films; common threads, films, and fine concretions of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B24tca—56 to 74 inches, pink (7.5YR 7/4) clay loam, brown (7.5YR 5/4) moist; weak, medium, subangular

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Abilene clay loam, 0 to 1 percent slopes	1,265	0.2	Grandfield loamy fine sand, 3 to 8 percent slopes	16,602	2.8
Abilene clay loam, 1 to 3 percent slopes	4,624	.8	Grandfield soils, 3 to 8 percent slopes, severely eroded	6,907	1.2
Abilene clay loam, 3 to 5 percent slopes	2,151	.4	Guadalupe fine sandy loam	7,307	1.2
Altus fine sandy loam	2,754	.5	Gypsum outcrop and Quinlan soils, undulating	3,525	.6
Berda and Mansker soils, 5 to 8 percent slopes	1,364	.2	Hardeman fine sandy loam, 3 to 5 percent slopes	2,593	.4
Berda and Potter soils, rolling	5,077	.9	Hardeman fine sandy loam, 5 to 8 percent slopes	7,595	1.3
Berda loam, dark surface variant, 3 to 5 percent slopes	1,306	.2	Likes loamy fine sand, 1 to 4 percent slopes	6,658	1.1
Bippus clay loam, 0 to 1 percent slopes	1,824	.3	Lincoln soils	9,629	1.6
Bippus clay loam, 1 to 3 percent slopes	1,554	.3	Lutie silt loam, 1 to 3 percent slopes	6,584	1.1
Bippus clay loam, 3 to 5 percent slopes	1,135	.2	Lutie silt loam, 3 to 5 percent slopes	15,068	2.5
Blown-out land-Tivoli complex	944	.2	Lutie and Cottonwood soils, 1 to 4 percent slopes	3,887	.7
Carey silt loam, 0 to 1 percent slopes	631	.1	Mansker and Portales soils, 1 to 3 percent slopes	1,180	.2
Carey silt loam, 1 to 3 percent slopes	10,430	1.8	Mansker and Portales soils, 3 to 5 percent slopes	2,015	.3
Clairemont silt loam	1,355	.2	Mobeetie fine sandy loam, 1 to 5 percent slopes	3,973	.7
Cobb loamy fine sand, loamy substratum, 1 to 3 percent slopes	3,784	.6	Mobeetie fine sandy loam, 5 to 8 percent slopes	5,118	.9
Cobb loamy fine sand, loamy substratum, 3 to 5 percent slopes	1,099	.2	Mobeetie and Potter soils, rolling	3,503	.6
Delwin fine sand, 0 to 3 percent slopes	38,529	6.5	Obaro silt loam, 3 to 5 percent slopes, eroded	763	.1
Delwin soils, 2 to 5 percent slopes, severely eroded	1,429	.2	Obaro and Quinlan soils, rolling	32,156	5.4
Devol loamy fine sand, 0 to 3 percent slopes	35,609	6.0	Paducah silt loam, 1 to 3 percent slopes	1,004	.2
Devol loamy fine sand, 3 to 8 percent slopes	64,779	10.9	Paducah silt loam, 3 to 5 percent slopes	1,316	.2
Devol soils, undulating, severely eroded	19,027	3.2	Potter soils, 1 to 4 percent slopes	1,441	.2
Dodson silt loam, 0 to 1 percent slopes	1,787	.3	Potter and Berda soils, 8 to 15 percent slopes	1,047	.2
Dodson silt loam, 1 to 2 percent slopes	1,491	.2	Pratt fine sand, 1 to 4 percent slopes	56,163	9.5
Gageby clay loam	3,738	.6	Pullman silty clay loam, 0 to 1 percent slopes	350	.1
Grandfield fine sandy loam, 0 to 1 percent slopes	1,806	.3	Rough broken land	1,754	.3
Grandfield fine sandy loam, 1 to 3 percent slopes	27,272	4.6	Sweetwater soils	6,875	1.2
Grandfield fine sandy loam, 3 to 5 percent slopes	8,073	1.4	Tipton loam, 0 to 1 percent slopes	1,584	.3
Grandfield fine sandy loam, 3 to 5 percent slopes, eroded	3,661	.6	Tipton loam, 1 to 3 percent slopes	1,033	.2
Grandfield loamy fine sand, 0 to 3 percent slopes	93,991	15.9	Tivoli fine sand	30,255	5.1
			Veal fine sandy loam, 1 to 6 percent slopes	4,522	.8
			River channel and water areas	7,104	1.2
			Total	592,000	100.0

blocky structure; hard, friable; few clay films; about 35 percent fine to coarse concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

C—74 to 85 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; massive; hard, friable; few fine to medium concretions of calcium carbonate; calcareous; moderately alkaline.

The A1 horizon ranges from 5 to 12 inches in thickness. The A and B1 horizons are dark grayish brown, very dark grayish brown, dark brown, or brown. The B1 horizon ranges from 4 to 7 inches in thickness. The Bt horizon is dark brown, grayish brown, brown, light brown, or reddish brown above the B24tca horizon. Depth to the B24tca horizon ranges from 24 to 60 inches. The B24tca horizon is pink, very pale brown, light brown, or brown. The C horizon is pink, brown, or light brown.

Abilene clay loam, 0 to 1 percent slopes (AbA).—This soil occupies ridges and slightly concave areas. The slope is dominantly about 0.5 percent.

This soil has a surface layer of dark-brown clay loam about 6 inches thick. The next layer in sequence from the top is 18 inches of dark-brown clay loam; 32 inches of grayish-brown, calcareous clay loam; and 8 inches of brown clay loam that is about 25 percent visible calcium carbonate. The underlying material is light-brown, calcareous clay loam.

Included with this soil in mapping are small areas of Mansker soils.

Most areas of this soil are cultivated. The soil is well-suited to crops commonly grown in the county. A thin crust forms on the surface after most rains. The hazard of soil blowing is slight. Capability unit IIc-4, dryland; capability unit I-1, irrigated; Deep Hardland range site.

Abilene clay loam, 1 to 3 percent slopes (AbB).—This soil is on broad, slightly convex plains that are irregular in shape. It has the profile described as typical for the series. The slope is dominantly about 1.8 percent.

Included with this soil in mapping are small areas of Mansker and Bippus soils.

About half the acreage of this soil is used for range, and the other half is cultivated. Some runoff occurs during heavy rain. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Capability unit IIIe-2, dryland; capability unit IIe-1, irrigated; Deep Hardland range site.

Abilene clay loam, 3 to 5 percent slopes (AbC).—This soil is on ridges and hillsides below the edge of the High Plains. Generally, the areas are less than 30 acres in size and are irregular in shape. The slope is dominantly about 4 percent.

This soil typically has a surface layer of dark-brown clay loam about 9 inches thick. The next layer in sequence from the top is 16 inches of dark-brown clay

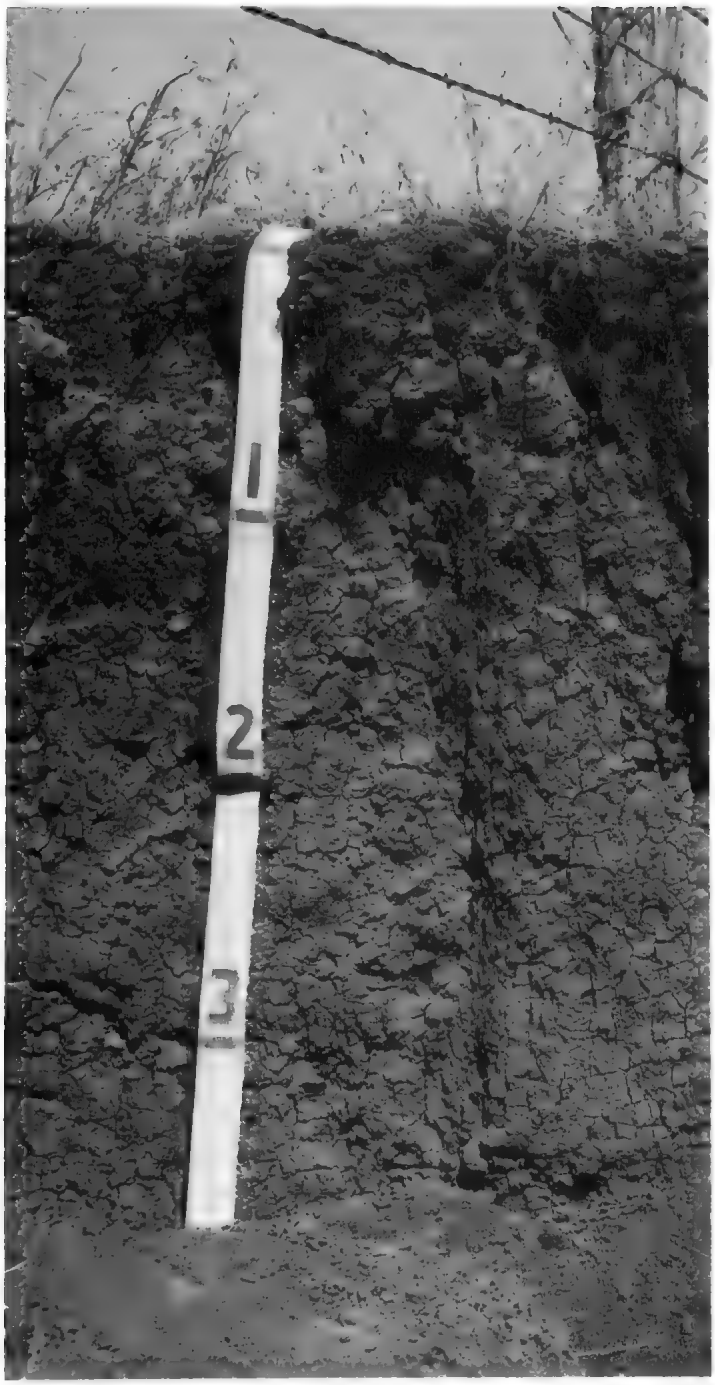

Figure 7.—**Profile of an Abilene clay loam, showing blocky structure.**

loam; 12 inches of brown, calcareous clay loam; and 8 inches of pink clay loam that is about 40 percent visible calcium carbonate. Below this is a layer of light-brown clay loam about 25 inches thick.

Included with this soil in mapping are areas of Mansker and Berda soils. Also included are some small eroded areas having rills and gullies.

This soil is used mostly for range, but a few areas are cultivated. Some rainfall is lost through runoff. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Capability unit IVe-1, dryland; Deep Hardland range site.

Altus Series

The Altus series consists of deep, moderately permeable soils on uplands. These soils formed in loamy sediment.

These soils typically have a surface layer of dark-brown fine sandy loam about 8 inches thick. The next layer is dark-brown, friable sandy clay loam in the upper 24 inches and brown, calcareous sandy clay loam in the lower 10 inches. The upper 8 inches of the underlying material is very pale brown sandy clay loam that is about 35 percent calcium carbonate. Below this, and extending to a depth of 55 inches, is very pale brown, calcareous sandy clay loam.

Altus soils are well drained and have high available water capacity.

Typical profile of Altus fine sandy loam, 0.1 mile west on Texas Highway 152 from its junction with Farm Road 592, then 50 feet north, in a cultivated field about 9.0 miles east of Wheeler:

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; weak, fine, granular structure; slightly hard, very friable; neutral; abrupt, smooth boundary.

B21t—8 to 20 inches, dark-brown (10YR 3/3) sandy clay loam, very dark brown (10YR 2/3) moist; moderate, very coarse, prismatic structure parting to weak, fine, subangular blocky; very hard, friable; common worm casts; few thin clay films; neutral; gradual, smooth boundary.

B22t—20 to 32 inches, dark-brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate, very coarse, prismatic structure parting to weak, medium, subangular blocky; very hard, friable; common worm casts; few thin clay films; mildly alkaline; gradual, wavy boundary.

B3ca—32 to 42 inches, brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak, fine, subangular blocky structure; very hard, friable; few quartz pebbles as much as 1 inch in diameter; about 5 percent of volume is common films and few very fine concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C1ca—42 to 50 inches, very pale brown (10YR 7/4) sandy clay loam, light yellowish brown (10YR 6/4) moist; weak, fine, subangular blocky structure; hard, friable; about 35 percent of volume is few films and threads and many medium to very fine concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

C2—50 to 55 inches, very pale brown (10YR 7/4) sandy clay loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable; common films and medium to very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon is dark brown, very dark grayish brown, or dark grayish brown. It ranges from 6 to 18 inches in thickness. The B2t horizon is brown, dark brown, or dark grayish brown. Structure of the B2t horizon is weak to moderate, fine to medium, subangular blocky to moderate, very coarse prismatic. The B3ca horizon is brown to reddish brown. This horizon is missing in about 50 percent of the areas. Depth to the C1ca horizon ranges from 27 to 50 inches. The C1ca horizon is very pale brown, light yellowish brown, light brown, or pale brown. The content of calcium carbonate in the C1ca horizon ranges from 15 to about 40

percent. The C horizon is loamy fine sand, fine sandy loam, or sandy clay loam.

Altus fine sandy loam (Af).—This soil occupies slightly concave and plane areas. The slope ranges from 0 to 1 percent but is dominantly about 0.6 percent.

Included with this soil in mapping are small areas of Grandfield and Devol soils. Also included are areas of soils that are similar to Altus soils but have buried clayey layers.

Most of this soil is cultivated. This soil receives some outside water, and crops are sometimes damaged by standing water. The hazard of soil blowing is moderate. Capability unit IIe-3, dryland; capability unit IIe-4, irrigated; Sandy Loam range site.

Berda Series

The Berda series consists of deep, calcareous, moderately permeable soils on uplands. These soils formed in calcareous, loamy sediment.

These soils typically have a surface layer of grayish-brown, calcareous loam about 11 inches thick. The next layer is brown loam in the upper 15 inches and light yellowish-brown loam in the lower 16 inches. The lower part is about 4 percent calcium carbonate. The underlying material is pink, calcareous loam.

Berda soils are well drained and have high available water capacity.

Typical profile of Berda loam in an area of Berda and Potter soils, rolling, 2.0 miles east of the northwest corner of Wheeler County on Farm Road 1268, then 2.6 miles south on a county road, then 0.3 mile east in a pasture:

A1—0 to 11 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, fine, granular structure; slightly hard, friable; few worm casts; few fine fragments of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B21—11 to 26 inches, brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak, coarse, prismatic structure parting to moderate, fine, subangular blocky; slightly hard, friable; common worm casts; common films and few, fine, soft masses of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22ca—26 to 42 inches, light yellowish-brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; few worm casts; about 4 percent very fine to fine soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—42 to 60 inches, pink (7.5YR 7/4) loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable; common films and few very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 8 to 14 inches in thickness. It is grayish brown or brown loam or clay loam. The B21 horizon ranges from 10 to 24 inches in thickness and is brown, grayish brown, or pale brown. Structure of the B21 horizon is weak to moderate, fine to medium, and granular, subangular blocky, or prismatic. The B22ca horizon is pale brown, light yellowish brown, or pink. It ranges from 15 to 30 inches in thickness. The content of calcium carbonate in the B22ca horizon ranges from 3 to 12 percent. The C horizon is brown, pale brown, very pale brown, pink, or light gray. Depth to the C horizon ranges from 40 inches to more than 60 inches.

Berda and Mansker soils, 5 to 8 percent slopes (BmD).—The soils in this undifferentiated group are in irregularly shaped areas that range from 20 to 100 acres in size. These soils are along ridges, on hillsides, and in valleys. The slope is dominantly about 7 percent.

About 66 percent of this mapping unit is Berda soil, 25 percent is Mansker soil, and 9 percent is included soils. From one mapped area to another, however, the percentage of Berda and Mansker soils varies. The Berda soil makes up 20 to 75 percent of the areas, and the Mansker soil 10 to 50 percent. The Berda soil is in convex and concave positions below the Mansker soil, which is on ridgetops. Soil areas are not uniform and occur without regularity.

The Berda soil has a surface layer of grayish-brown loam about 11 inches thick. The upper 19 inches of the next layer is pale-brown clay loam, and the lower 15 inches is pale-brown clay loam that is about 8 percent calcium carbonate. The underlying material is pink, calcareous loam.

The Mansker soil has a surface layer of dark grayish-brown loam about 10 inches thick. The next layer in sequence from the top is 3 inches of brown clay loam; 15 inches of light-brown clay loam that is about 20 percent calcium carbonate; and 20 inches of reddish-yellow clay loam that is about 10 percent calcium carbonate. The underlying material is reddish-yellow, calcareous loam.

Included with these soils in mapping are areas of Potter and Gageby soils. Also included are areas of soils that have slopes of more than 8 percent.

This mapping unit is not suitable for cultivation, because of the steep slopes. It is better suited to range. Both soils are in capability unit VIe-2, dryland, and Hardland Slopes range site.

Berda and Potter soils, rolling (BpD).—The soils in this undifferentiated unit are in areas just below the High Plains. The areas are irregular in shape and range from about 50 acres to more than 200 acres in size. The slope ranges from 5 to 12 percent but is dominantly about 8 percent.

The composition of this mapping unit is more variable and the areas are generally much larger than those of most other units in the county. Mapping has been controlled well enough, however, for the anticipated uses of the soils.

About 45 percent of the mapping unit is Berda soil, 20 percent is Potter soil, and 35 percent is included soils. From one mapped area to another, however, the percentage of Berda and Potter soils varies. The Berda soil makes up 17 to 35 percent of the areas, and the Potter soil 9 to 35 percent. The Berda soil is on plane and convex hillsides below the Potter soil, which is on gently sloping to strongly sloping knolls and ridges. Soil patterns are not uniform and they occur without regularity.

The Berda soil has the profile described as typical for the Berda series. The Potter soil has a surface layer of grayish-brown, calcareous loam about 8 inches thick. The next layer is a white, slightly platy caliche, about 10 inches thick, that is about 40 percent clay loam. The underlying material is pink caliche that is about

50 percent platy caliche rock and about 50 percent loamy material.

Included with these soils in mapping are areas of Bippus, Mobeetie, and Mansker soils, small areas of Rough broken land, and areas of Gageby soils along drainageways. Also included are areas of soils that are similar to the Berda soil but have a darker surface layer.

This mapping unit is not suitable for cultivation. It is used mostly for range and wildlife. Berda soil is in capability unit VIe-2, dryland, and Hardland Slopes range site. Potter soil is in capability unit VIIs-1, dryland, and Very Shallow range site.

Berda Series, Dark Surface Variant

The Berda series, dark surface variant, consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy sediment.

These soils typically have a surface layer of dark grayish-brown, calcareous loam about 12 inches thick. The next layer is grayish-brown, friable loam in the upper 23 inches and pale-brown loam in the lower 15 inches. The lower part is about 4 percent calcium carbonate. The underlying material is brown, calcareous loam that extends to a depth of 65 inches.

Berda soils are well drained and have high available water capacity.

Typical profile of Berda loam, dark surface variant, 3 to 5 percent slopes, 3.1 miles north on Farm Road 48 from its junction with Farm Road 1046 in New Mobeetie, then 200 feet west in a pasture:

A1—0 to 12 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, granular structure; hard, friable; common worm casts; few fine fragments of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B21—12 to 35 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, fine, granular structure parting to weak, fine, subangular blocky; hard, friable; many worm casts; common films and few, fine, soft masses of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22ca—35 to 50 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak, coarse, prismatic structure; hard, friable; common worm casts; about 4 percent very fine soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—50 to 65 inches, brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; hard, friable; common films and few very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 11 to 15 inches in thickness and is grayish brown, brown, dark brown, or dark grayish brown. The B21 horizon ranges from 10 to 24 inches in thickness. It is brown, grayish brown, or light brownish gray. Structure of the B21 horizon is weak to moderate, fine to medium, and granular, subangular blocky, or prismatic. The B22ca horizon is very pale brown, pale brown, brown, or pink. Depth to the B22ca horizon ranges from 21 to 36 inches. The content of calcium carbonate in the B22ca horizon ranges from 3 to 14 percent. The B22ca horizon is absent in some places. The C horizon is brown, pale brown, very pale brown, pink, or light gray.

Berda loam, dark surface variant, 3 to 5 percent slopes (BeC).—This soil is on plane to concave foot slopes and sides of valleys. The slope is dominantly about 4 percent. Most areas are oval.

Included with this soil in mapping are areas of Mobeetie, Bippus, Mansker, Veal, and Potter soils.

Most of this soil is used for range, but a few small areas are cultivated. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Capability unit IVe-2, dryland; Hardland Slopes range site.

Bippus Series

The Bippus series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy sediment.

These soils typically have a surface layer of very dark grayish-brown clay loam about 14 inches thick. The next layer is dark grayish-brown clay loam in the upper 10 inches and grayish-brown clay loam in the lower 31 inches. The lower part contains threads and films of calcium carbonate. The underlying material is brown, calcareous clay loam.

Bippus soils are well drained and have a high available water capacity.

Typical profile of Bippus clay loam, 0 to 1 percent slopes (fig. 8), 6.0 miles north of New Mobeetie to a point where Farm Road 48 crosses the Hemphill County line, then 1.25 miles west on county line, then 100 feet south in a pasture:

A1—0 to 14 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate, fine and medium, granular structure; hard, friable; many medium and fine pores; many worm casts; mildly alkaline; clear, smooth boundary.

B21—14 to 24 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium and fine, subangular blocky structure; very hard, firm; common worm casts; mildly alkaline; clear, smooth boundary.

B22ca—24 to 55 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate, coarse, prismatic structure parting to weak, medium and fine, subangular blocky; very hard, firm; common films and threads of calcium carbonate; calcareous; mildly alkaline; gradual, wavy boundary.

C—55 to 65 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; massive; hard, friable; few films and threads of calcium carbonate; calcareous; moderately alkaline.

The A horizon is very dark grayish brown or dark grayish brown and ranges from 12 to 24 inches in thickness. The B21 horizon ranges from 7 to 24 inches in thickness. It is grayish brown, dark grayish brown, or dark brown. The B22ca horizon begins at a depth of 22 to 40 inches. It ranges from 12 to 35 inches in thickness and is grayish brown, pale brown, brown, light brown, or light yellowish brown. The content of visible calcium carbonate is less than 5 percent. Depth to the C horizon ranges from 35 inches to more than 60 inches. The C horizon is light yellowish brown, brown, pale brown, or light brown. It is loam or clay loam.

Bippus clay loam, 0 to 1 percent slopes (BrA).—This soil occupies plane and concave areas along streams in the valley floors. The areas are on old alluvium and on benchlike foot slopes that receive some runoff. These areas are elongated and parallel the drainageways. This soil has the profile described as typical for the series. The slope is dominantly about 0.4 percent.

Figure 8.—**Profile of a Bippus clay loam, showing deeply darkened surface layer.**

Included with this soil in mapping are areas of Gageby and Tipton soils and small areas of Bippus soils that have a surface layer of fine sandy loam.

Most areas of this soil are used for range and crops, but some areas are inaccessible or are too small for cropping. This soil is well suited to crops commonly grown in the county. The hazard of soil blowing is slight. Capability unit IIc-1, dryland; capability unit I-2, irrigated; Deep Hardland range site.

Bippus clay loam, 1 to 3 percent slopes (BrB).—This soil occupies plane and concave foot slopes and alluvial fans that average about 20 acres in size. The slope is dominantly about 2 percent.

This soil has a surface layer of dark grayish-brown clay loam about 15 inches thick. The next layer is dark-brown clay loam in the upper 7 inches and pale-brown clay loam that contains threads and films of calcium carbonate in the lower 15 inches. The underlying material is pale-brown, calcareous clay loam.

Included with this soil in mapping are small areas of Bippus soils that have a surface layer of fine sandy loam and small areas of Gageby, Guadalupe, and Tipton soils.

This soil is used for crops and range. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Capability unit IIIe-2, dryland; capability unit IIe-2, irrigated; Deep Hardland range site.

Bippus clay loam, 3 to 5 percent slopes (BrC).—This soil occupies weakly concave and plane foot slopes that are irregular in shape. Some scouring and deposits of fresh alluvium occur along drainageways, and stream channels cut at the edge of some areas. The slope is dominantly about 3.7 percent.

This soil has a surface layer of very dark grayish-brown clay loam about 22 inches thick. The next layer is grayish-brown clay loam in the upper 16 inches and pale-brown clay loam that contains threads and films of calcium carbonate in the lower 17 inches. The underlying material is brown clay loam.

Included with this soil in mapping are areas of Abilene, Berda, and Mansker soils and areas of Bippus soils that have a surface layer of fine sandy loam.

Most of this soil is used for range, but some small areas are used for crops. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Capability unit IVe-1, dryland; Deep Hardland range site.

Blown-out Land

Blown-out land consists of gently sloping to strongly sloping blowout pits of fine sand and loamy fine sand material. These areas have no evidence of soil formation. The pits are barren, and major rains and windstorms cause more erosion. These are critical erosion areas and spread onto other soils if not controlled.

Blown-out land-Tivoli complex (Bt).—This complex occurs where wind erosion has been severe. It consists of accumulated sand and exposed soil material, and most of it occurs within areas of sandy soils. The areas average about 20 acres in size. The slope ranges from 2 to 10 percent.

About 50 percent of this mapping unit is Blown-out land, 30 percent is Tivoli soil, and 20 percent is included soils. However, the percentage of Blown-out land and the Tivoli soil varies from one mapped area to another. Blown-out land makes up 40 to 70 percent of the areas, and the Tivoli soil 20 to 40 percent. Included in mapping are Pratt, Devol, and Delwin soils.

Blown-out land consists of barren pits (fig. 9) of fine sand and loamy fine sand material. The sides of some pits contain U-shaped gullies that are actively eroding and cutting into the underlying material. The bottoms of these pits are about 5 to 25 feet below the original surface.

The Tivoli soil has a surface layer of pale-brown fine sand about 5 inches thick. The underlying material is reddish-yellow fine sand.

These critical erosion areas should be stabilized by all practical methods. This mapping unit is sparsely covered with vegetation, the dunes are constantly shifting, and the shape of the blown-out area is changing. Both Blown-out land and the Tivoli soil are in capability unit VIIe-1, dryland; Blown-out land is not in a range site; the Tivoli soil is in Deep Sand range site.

Figure 9.—**Blown-out land-Tivoli complex, showing blown-out pit.**

Carey Series

The Carey series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy, red-bed material.

These soils typically have a surface layer of dark grayish-brown silt loam about 14 inches thick. The upper 22 inches of the next layer is reddish-brown, calcareous silty clay loam; the next 12 inches is reddish-brown silty clay loam that is about 10 percent visible calcium carbonate; and the lower 22 inches is silt loam. The underlying material is reddish-yellow, calcareous silt loam.

Carey soils are well drained and have high available water capacity.

Typical profile of Carey silt loam, 1 to 3 percent slopes, 1.0 mile east of the water tower in downtown Shamrock on Farm Road 2033, then 100 feet north in a cultivated field:

Ap—0 to 14 inches, dark grayish-brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, fine and medium, granular structure; slightly hard, very friable; many roots; common medium and fine pores; common worm casts; neutral; clear, smooth boundary.

B21t—14 to 22 inches, reddish-brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/3) moist; moderate, fine, subangular blocky structure; hard, friable; few worm casts; few thin clay films on ped faces; few coatings of calcium carbonate on peds; calcareous; moderately alkaline; gradual, wavy boundary.

B22t—22 to 36 inches, reddish-brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/4) moist; moderate, fine and medium, subangular blocky structure; hard, friable; clay films on ped faces; few films and threads of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B23tca—36 to 48 inches, reddish-brown (2.5YR 5/4) silty clay loam, reddish brown (2.5YR 4/4) moist; moderate, medium, subangular blocky structure; hard, friable; clay films on most ped surfaces; about 10 percent visible soft masses and coatings of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B3—48 to 70 inches, red (2.5YR 5/6) silt loam, red (2.5YR 4/6) moist; weak, medium, subangular blocky structure; hard, friable; few, fine, soft masses and coatings of calcium carbonate; common, fine, greenish-gray shale fragments; calcareous; moderately alkaline; gradual, wavy boundary.

C—70 to 80 inches, reddish-yellow (5YR 6/6) silt loam, yellowish red (5YR 5/6) moist; massive; slightly hard, very friable; few, fine, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 11 to 19 inches in thickness and is brown, dark brown, or dark grayish brown. The soil becomes calcareous at a depth of 15 to 30 inches. The B2t

horizon is brown, reddish brown, yellowish red, or dark brown. Depth to the B23tca horizon ranges from 23 to 50 inches. The B23tca horizon is reddish brown, reddish yellow, yellowish red, light reddish brown, or light brown. It ranges from 6 to 20 inches in thickness. The content of visible calcium carbonate in the B23tca horizon ranges from 3 to 12 percent. The B3 horizon ranges from 6 to 25 inches in thickness. The B3 and C horizons are red, reddish brown, reddish yellow, or yellowish red. They are silt loam or silty clay loam.

Carey silt loam, 0 to 1 percent slopes (CaA).—This soil occupies weakly concave and plane areas that average about 30 acres in size. The slope is dominantly about 0.7 percent.

This soil has a surface layer of dark grayish-brown silt loam about 12 inches thick. The next layer is dark-brown silty clay loam in the upper 7 inches; reddish-brown, calcareous silty clay loam in the next 13 inches; and light-brown, silty clay loam in the lower 20 inches. The lower part is about 10 percent visible calcium carbonate. The underlying material is reddish-yellow, calcareous silt loam.

Included with this soil in mapping are areas of Dodson and Lutie soils.

This soil is used mostly for crops, and it is well suited to crops commonly grown in the county. Most areas receive some additional water from areas at higher elevations. The hazard of soil blowing is slight. Capability unit IIc-2, dryland; capability unit I-3, irrigated; Mixedland range site.

Carey silt loam, 1 to 3 percent slopes (CaB).—This soil occupies convex, plane, and weakly concave areas that average about 50 acres in size. It has the profile described as typical for the series. The slope is dominantly about 2.2 percent.

Included with this soil in mapping are areas of Paducah, Lutie, Quinlan, and Dodson soils.

This soil is used mostly for crops, but some of it is used for range. A few areas are irrigated. The hazards of soil blowing and water erosion are slight. Capability unit IIe-1, dryland; capability unit IIe-2, irrigated; Mixedland range site.

Clairemont Series

The Clairemont series consists of deep, moderately permeable soils on bottom lands. These soils formed in calcareous, loamy alluvium.

These soils typically have a surface layer of brown, calcareous silt loam about 6 inches thick. The underlying material is yellowish-red, very friable silt loam in the upper 8 inches; brown, friable, stratified silt loam in the next 14 inches; and reddish-brown, stratified silty clay loam in the lower 8 inches. Below this is dark grayish-brown, weakly stratified loam.

Clairemont soils are well drained and have high available water capacity.

Typical profile of Clairemont silt loam, 3.6 miles east on Farm Road 592 from its junction in Twitty with U.S. Highway 83, then 30 feet south in a cultivated field:

Ap—0 to 6 inches, brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; weak, fine and medium, granular structure; slightly hard, very friable; calcareous; moderately alkaline; abrupt, smooth boundary.

C1—6 to 14 inches, yellowish-red (5YR 5/6) silt loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable; common worm casts; distinct bedding planes; calcareous; moderately alkaline; abrupt, wavy boundary.

C2—14 to 28 inches, brown (7.5YR 4/4) silt loam, dark brown (7.5YR 3/4) moist; massive; hard, friable; distinct bedding planes of very fine sandy loam; few films and threads of calcium carbonate; calcareous; moderately alkaline; abrupt, wavy boundary.

C3—28 to 36 inches, reddish-brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable; distinct bedding planes; few films, threads, and fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, wavy boundary.

A1b—36 to 60 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm; many worm casts; faint bedding planes; few films and threads of calcium carbonate; calcareous; moderately alkaline.

The Ap horizon is brown, reddish brown, light brown, light reddish brown, or yellowish red. It is loam, silt loam, or silty clay loam. Bedding planes, or strata, range from faint to prominent in all horizons except the Ap. The bedding planes range from loamy sand to clay loam and are as much as ½ inch thick. A darkened, buried horizon occurs in about 50 percent of the areas.

Clairemont silt loam (Cm).—This soil is on flood plains of creeks and rivers. The surface is weakly undulating. The areas are narrow and elongated in shape. The slope ranges from 0 to 1 percent but is dominantly about 0.8 percent. This soil is low lying, and most areas are subject to occasional flooding. Most floods last less than 6 hours and do moderate to minor damage to growing crops. Each flood leaves a thin layer of fresh soil material on the surface.

Included with this soil in mapping are areas of Lincoln, Gageby, Guadalupe, and Sweetwater soils.

This soil is used mostly for range, but a few areas are used for crops. The hazard of wind erosion is slight. Capability unit IIc-3, dryland; capability unit I-3, irrigated; Loamy Bottomland range site.

Cobb Series

The Cobb series consists of deep to moderately deep, moderately permeable soils on uplands. These soils formed in loamy sandstone material.

These soils typically have a surface layer of reddish-brown loamy fine sand about 16 inches thick. The next layer is red, mildly alkaline sandy clay loam in the upper 22 inches and red very fine sandy loam in the lower 12 inches. The lower part contains some weakly cemented sandstone that increases in content with depth. The underlying material is weakly cemented, red very fine sandy loam.

Cobb soils are well drained and have moderate available water capacity.

Typical profile of Cobb loamy fine sand, loamy substratum, 1 to 3 percent slopes, 3.0 miles south and 2.0 miles west from Kelton on Farm Road 592, then 2.0 miles west on a county road, then 50 feet north in a cultivated field:

Ap—0 to 6 inches, reddish-brown (5YR 4/4) loamy fine sand, dark reddish brown (5YR 3/4) moist; weak, fine, granular structure; loose; mildly alkaline; gradual, smooth boundary.

A1—6 to 16 inches, reddish-brown (5YR 4/4) loamy fine sand, dark reddish brown (5YR 3/4) moist; weak, fine, subangular blocky structure; slightly hard, very friable; many worm casts; mildly alkaline; clear, smooth boundary.

B21t—16 to 28 inches, red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; weak, medium, subangular blocky structure; hard, friable; few thin clay films on ped surfaces; mildly alkaline; gradual, wavy boundary.

B22t—28 to 38 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; weak, medium, subangular blocky structure; hard, friable; few medium quartz pebbles; few thin clay films on ped surfaces; mildly alkaline; gradual, wavy boundary.

B3—38 to 50 inches, red (2.5YR 5/6) very fine sandy loam, red (2.5YR 4/6) moist; weak, fine, subangular blocky structure; slightly hard, very friable; pockets of sandstone that have weak, platy, rock structure; amount of sandstone increases to 60 percent as depth increases; mildly alkaline; gradual, wavy boundary.

C—50 to 65 inches, weakly cemented, red (2.5YR 5/8) very fine sandy loam, red (2.5YR 4/8) moist; fractured and some weak, platy, rock structure; easily dug with a spade, hardness about 2 on Mohs scale; mildly alkaline.

The A horizon is brown or reddish brown and ranges from 6 to 18 inches in thickness. The Bt horizon ranges from 15 to 35 inches in thickness. It is brown, yellowish red, red, reddish brown, or light reddish brown. A B3 horizon occurs in about 50 percent of the areas. It is light reddish brown, red, or reddish brown, and it is as much as 20 inches thick. Depth to the C horizon ranges from 30 to 60 inches. The C horizon is red, light reddish brown, or reddish brown.

Cobb loamy fine sand, loamy substratum, 1 to 3 percent slopes (CoB).—This soil is in areas that have a weakly undulating surface. It has the profile described as typical for the series. The slope is dominantly about 2 percent.

Included with this soil in mapping are areas of Grandfield, Devol, Lutie, and Delwin soils. Also included are small areas of Cobb soils that have a surface layer of fine sandy loam and areas of a soil that is similar to Cobb soils but has a calcareous subsoil.

This soil is used mostly for crops. The hazard of soil blowing is high, and the hazard of water erosion is slight. Capability unit IVe-6, dryland; capability unit IIIe-2, irrigated; Sandyland range site.

Cobb loamy fine sand, loamy substratum, 3 to 5 percent slopes (CoC).—This soil occupies convex areas that are generally about 25 acres in size and are irregular to oval in shape. The slope is dominantly about 4.5 percent.

This soil has a surface layer of brown loamy fine sand about 9 inches thick. The next layer is reddish-brown sandy clay loam in the upper 16 inches and red very fine sandy loam that contains weakly cemented sandstone in the lower 20 inches. The underlying material is weakly cemented, red very fine sandy loam.

Included with this soil in mapping are areas of Grandfield, Devol, Lutie, and Delwin soils. Also included are small areas of Cobb soils that have a surface layer of fine sandy loam and some areas of a soil that is similar to Cobb soils but has a calcareous subsoil.

This soil is used mostly for range, but a few areas are still used for crops. The hazard of soil blowing is high, and the hazard of water erosion is moderate. Capability unit VIe-6, dryland; capability unit IVe-2, irrigated; Sandyland range site.

Cottonwood Series

The Cottonwood series consists of very shallow, moderately permeable soils on uplands. These soils formed in beds of gypsum.

These soils typically have a surface layer of reddish-brown, calcareous silt loam about 8 inches thick. The underlying material extends to a depth of 60 inches and is beds of white, soft to hard gypsum.

Cottonwood soils are well drained and have low available water capacity. The rooting of plants is restricted by the gypsum material.

In Wheeler County the Cottonwood soils are mapped only in an undifferentiated group with Lutie soils.

Typical profile of Cottonwood silt loam in an area of Lutie and Cottonwood soils, 1 to 4 percent slopes, 2.4 miles south of Twitty on U.S. Highway 83, then 0.1 mile west in a pasture:

A1—0 to 8 inches, reddish-brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; moderate, fine, granular structure; hard, friable; few worm casts; calcareous; moderately alkaline; abrupt, wavy boundary.

C—8 to 60 inches, white (10YR 8/1), weakly cemented gypsum; calcareous; moderately alkaline.

The A horizon is brown or reddish-brown silt loam or clay loam. It ranges from 5 to 9 inches in thickness. The C horizon generally is white, but it is brownish in some areas. It ranges from soft, powdery to hard, cemented gypsum and calcium carbonate, and its hardness ranges from 1 to about 2.5 on Mohs scale.

Delwin Series

The Delwin series consists of deep, moderately permeable soils on uplands. These soils formed in loamy outwash and eolian material.

These soils typically have a surface layer of fine sand about 16 inches thick. The upper 5 inches of the surface layer is light brownish gray, and the lower 11 inches is brown. The next layer is reddish-brown, friable sandy clay loam in the upper 16 inches and yellowish-red, neutral sandy clay loam that extends to a depth of 80 inches. A few pockets of loamy sand and alternating bands of reddish-yellow sandy loam are in the lower 20 inches of this layer.

Delwin soils are well drained and have moderate available water capacity.

Typical profile of Delwin fine sand, 0 to 3 percent slopes, 0.3 mile east and 0.9 mile south by county roads from where Farm Road 1046 crosses the railroad on the south side of Allison, then 0.05 mile west on a county road, then 100 feet north in a field:

Ap—0 to 5 inches, light brownish-gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; slightly acid; clear, smooth boundary.

A1—5 to 16 inches, brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4) moist; single grained; loose; slightly acid; abrupt, wavy boundary.

B21t—16 to 32 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; very hard, friable; sand grains are coated and bridged with clay; dark clay films on vertical faces of prisms; few fine quartz pebbles; neutral; diffuse, smooth boundary.

B22t—32 to 45 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, medium, subangular blocky structure; very hard, friable; sand grains are coated and bridged with clay; few fine quartz pebbles; neutral; diffuse, smooth boundary.

B23t—45 to 60 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, fine, subangular blocky structure; hard, friable; neutral; gradual, smooth boundary.

B24t—60 to 72 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, fine, subangular blocky structure; hard, friable; few pockets of loamy sand; neutral; gradual, smooth boundary.

B3—72 to 80 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak, medium, subangular blocky structure; hard, friable; alternating bands of reddish-yellow (5YR 7/6) sandy loam, reddish yellow (5YR 6/6) moist; massive; loose; neutral.

The A horizon is brown, light yellowish brown, light gray, pale brown, grayish brown, light brownish gray, or light brown. It ranges from 5 to 20 inches in thickness. The B2t horizon is brown, dark brown, reddish brown, yellowish red, reddish yellow, light red, or red. It ranges from 45 to 60 inches in thickness. Structure of the B2t horizon is weak to moderate, fine to coarse, and subangular blocky to prismatic. The B3 horizon is red, light red, yellowish red, or reddish yellow. It ranges from 6 to 20 inches in thickness and is fine sandy loam, loamy fine sand, or sandy clay loam.

Delwin fine sand, 0 to 3 percent slopes (DeB).—This nearly level to gently undulating soil is on plains. The areas are broad and range to as large as several hundred acres, but they average about 150 acres in size. This soil has the profile described as typical for the series. The slope is dominantly about 1.8 percent.

Included with this soil in mapping are areas of Pratt and Grandfield soils and a few small areas of Delwin soils that have a surface layer of fine sand more than 20 inches thick.

This soil is used mostly for range, but about one-fourth the acreage is used for crops. A few areas are irrigated by sprinklers. The hazard of water erosion is slight in gently sloping areas. The hazard of soil blowing is high. Capability unit IVe-6, dryland; capability unit IIIe-2, irrigated; Sandyland range site.

Delwin soils, 2 to 5 percent slopes, severely eroded (DfC3).—This mapping unit is on convex ridges and on hillsides. The slope is dominantly about 3.5 percent.

The soils in this mapping unit have a light-brown, loose surface layer about 5 inches thick that is typically fine sand but ranges from sand to sandy clay loam. The next layer is reddish-brown sandy clay loam in the upper 23 inches, yellowish-red sandy clay loam in the next 32 inches, and reddish-yellow sandy clay loam in the lower 10 inches. Below this is reddish-yellow fine sandy loam.

These soils have been eroded by both wind and water. Crossable and uncrossable gullies occur in most areas. The sandy clay loam subsoil is exposed on about 50 percent of the total acreage. On about 25 percent of the acreage, part of the original surface layer remains. On the remaining 25 percent, blowout pits have been eroded into the exposed soil material to a depth of several feet below the original surface.

Included with these soils in mapping are areas of Devol, Grandfield, and Pratt soils and areas of Delwin soils that are only slightly eroded.

All the acreage of these soils is now cultivated or has been in the past. Most areas are now in grass, but a few areas are still actively eroding. The hazard of water erosion is moderate, and the hazard of soil blowing is high. Capability unit VIe-6, dryland; Sandyland range site.

Devol Series

The Devol series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in sandy outwash and eolian material.

These soils typically have a surface layer of brown, neutral loamy fine sand about 16 inches thick. The next layer is reddish-brown fine sandy loam in the upper 9 inches and strong-brown loamy fine sand in the lower 13 inches. The underlying material is reddish-yellow, loose loamy sand that extends to a depth of 86 inches and is calcareous in the lower part.

Devol soils are well drained and have low available water capacity.

Typical profile of Devol loamy fine sand, 0 to 3 percent slopes, 3 miles west on Texas Highway 152 from its junction with Farm Road 48 in Mobeetie, then 50 feet north in a pasture:

A1—0 to 5 inches, brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak, fine, granular structure; loose, very friable; neutral; clear, smooth boundary.

A12—5 to 16 inches, brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak, fine, granular structure; loose, very friable; few fine quartz pebbles; neutral; clear, wavy boundary.

B2t—16 to 25 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak, very coarse, prismatic structure parting to weak, medium, subangular blocky; slightly hard, very friable; few fine quartz pebbles; sand grains are coated and bridged with clay; mildly alkaline; gradual, smooth boundary.

B3—25 to 38 inches, strong-brown (7.5YR 5/6) loamy fine sand, strong brown (7.5YR 4/6) moist; weak, fine, subangular blocky structure; loose, very friable; few fine quartz pebbles; mildly alkaline; gradual, smooth boundary.

C1—38 to 66 inches, reddish-yellow (7.5YR 7/6) loamy sand, reddish yellow (7.5YR 6/6) moist; single grained; loose; few fine quartz pebbles; mildly alkaline; gradual, smooth boundary.

C2—66 to 86 inches, reddish-yellow (7.5YR 8/6) loamy sand, reddish yellow (7.5YR 7/6) moist; single grained; loose; few fine quartz pebbles; few fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 12 to 18 inches in thickness, except in some eroded areas where it is as thin as 4 inches. The A horizon is brown or light brown. The B2t horizon ranges from 9 to 20 inches in thickness. The B2t and B3 horizons are brown, light brown, reddish brown, strong brown, yellowish red, or reddish yellow. The B3 horizon ranges from 9 to 22 inches in thickness. It is loamy fine sand or fine sandy loam. Depth to the C horizon ranges from 30 to 60 inches. The C horizon is brown, reddish yellow, yellowish red, or light brown.

Devol loamy fine sand, 0 to 3 percent slopes (DlB).—This soil is in areas that average about 40 acres in size. It has the profile described as typical of the series. The slope is dominantly about 2 percent. The surface is undulating, and drainage patterns are poorly defined.

Included with this soil in mapping are areas of Grandfield and Likes soils and small areas of Devol soils that have slopes of more than 3 percent.

This soil is used mostly for range or pasture. A few areas are used for crops. The hazard of soil blowing is high. Capability unit IVe-7, dryland; capability unit IVe-3, irrigated; Sandyland range site.

Devol loamy fine sand, 3 to 8 percent slopes (DlD).—This soil is on ridges and hillsides. The slope is dominantly about 6 percent. The surface is hummocky.

This soil has a surface layer of brown loamy fine sand about 16 inches thick. The next layer is brown fine sandy loam about 32 inches thick. The underlying material is reddish-yellow loamy fine sand.

Included with this soil in mapping are areas of Pratt, Grandfield, Likes, Veal, and Tivoli soils.

This soil is used for range (fig. 10). The hazard of soil blowing is high. Capability unit VIe-6, dryland; capability unit IVe-3, irrigated; Sandyland range site.

Figure 10.—**Area of native range on a Devol loamy fine sand.**

Devol soils, undulating, severely eroded (DmC3).—These gently sloping to sloping and undulating soils are on eroded ridges and hillsides. Slopes range from 2 to 6 percent but are dominantly about 5 percent. The areas generally are small but, in some places, range to as much as 200 acres in size.

These soils have a brown surface layer that is typically loamy fine sand but ranges to fine sandy loam. The next layer is brown fine sandy loam about 35 inches thick. The underlying material is reddish-yellow loamy fine sand.

Soil blowing and gully erosion are evident. On about 60 percent of the total acreage, all of the original surface layer of loamy fine sand is missing. Only 30 percent of the acreage is slightly eroded. About 10 percent consists of blowout pits and sand dunes. The pits average about 75 feet across and 150 feet in length, and they range from 4 to 12 feet in depth. Most pits have been eroded into the underlying material. These areas support a very thin stand of grass. Hummocks as much as 5 feet high occur on one or more sides of the pits. In most areas crossable gullies are common and there are some uncrossable gullies. The crossable gullies are at intervals of 100 feet. The uncrossable gullies are at intervals of 500 feet; they have been eroded into the underlying material and are as much as 8 feet deep and 10 feet across.

Most areas of these soils were cropland at one time, but nearly all of them have been put back to grass. Most areas are slowly healing. The hazard of soil blowing is high. Capability unit VIe-6, dryland; Sandyland range site.

Dodson Series

The Dodson series consists of deep, moderately slowly permeable soils on uplands. These soils formed in loamy red-bed material.

These soils typically have a surface layer of brown silt loam about 8 inches thick. The next layer is silty clay loam that extends to a depth of 86 inches. The upper 7 inches of this layer is brown, the next 35 inches is reddish brown, and the lower 36 inches is brown.

Dodson soils are well drained and have high available water capacity.

Typical profile of Dodson silt loam, 0 to 1 percent slopes, 2.0 miles east of the water tower in downtown Shamrock on Farm Road 2033, then 0.7 mile south on a county road, then 0.1 mile east in a cultivated field:

Ap—0 to 8 inches, brown (7.5YR 4/3) silt loam, dark brown (7.5YR 3/3) moist; weak, fine, granular structure; hard, friable; common worm casts; neutral; clear, smooth boundary.

B21t—8 to 15 inches, brown (7.5YR 4/2) silty clay loam, dark brown (7.5YR 3/2) moist; moderate, fine and medium, subangular blocky structure; hard, friable; common worm casts; few thin clay films on ped faces; mildly alkaline; clear, smooth boundary.

B22t—15 to 24 inches, reddish-brown (5YR 4/3) silty clay loam, dark reddish brown (5YR 3/3) moist; strong, medium, subangular blocky structure; hard, friable; few thin clay films on ped faces; mildly alkaline; gradual, smooth boundary.

B23t—24 to 50 inches, reddish-brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, subangular blocky structure; hard, friable; few thin clay films on ped faces; few, fine, soft masses of calcium carbonate beginning at a depth of 30 inches; calcareous beginning at a depth of 30 inches; moderately alkaline; gradual, wavy boundary.

B3—50 to 86 inches, brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; weak, fine and medium, subangular blocky structure; hard, friable; common films, threads, and fine soft masses of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown, dark brown, dark grayish brown, or very dark grayish brown and ranges from 4 to 20 inches in thickness. The B21t horizon is brown, reddish brown, very dark grayish brown, or dark grayish brown. It ranges from 7 to 14 inches in thickness. The upper 20 inches of the Bt horizon ranges from clay loam to silty clay loam, and the content of clay ranges from 35 to 40 percent. Depth to carbonates ranges from 30 to 50 inches. The B22t horizon is brown, reddish brown, or dark reddish brown and ranges from 6 to 14 inches in thickness. The B23t horizon is brown or reddish brown. It ranges from 12 to 30 inches in thickness. Depth to the B3 horizon ranges from 40 to more than 60 inches. The B3 horizon is brown or reddish brown and is loam, silt loam, clay loam, or silty clay loam.

Dodson silt loam, 0 to 1 percent slopes (DoA).—This soil occupies plane and weakly concave areas. It has the profile described as typical for the series. The slope is dominantly about 0.5 percent.

Included with this soil in mapping are areas of Lutie and Carey soils.

Most of this soil is used for crops, but a few areas are still in range. The soil is well suited to crops commonly grown in the county. The hazard of soil blowing is slight. Capability unit IIc-2, dryland; capability unit I-1, irrigated; Deep Hardland range site.

Dodson silt loam, 1 to 2 percent slopes (DoB).—This soil occupies plane or slightly concave plains and is in areas that are irregular in shape. The slope dominantly is about 1.3 percent.

This soil has a surface layer of dark-brown silt loam about 14 inches thick. The next layer is brown silty clay loam in the upper 14 inches, brown clay loam in the next 15 inches, and reddish brown silty clay loam in the lower 13 inches. The underlying material is reddish-brown silt loam.

Included with this soil in mapping are areas of Lutie and Carey soils and small, nearly level areas of Dodson soils. Also included are areas of soils that are similar to Dodson silt loam, but their dark surface layer is less than 20 inches thick.

This soil is used mostly for crops, but a few areas are used for range. The hazards of soil blowing and water erosion are slight. Capability unit IIe-1, dryland; Deep Hardland range site.

Gageby Series

The Gageby series consists of deep, moderately permeable soils on bottom lands. These soils formed in loamy alluvial sediment.

These soils typically have a surface layer of calcareous clay loam about 36 inches thick. This layer is brown in the upper 7 inches and dark grayish brown in the lower 29 inches. The next layer is brown clay loam about 9 inches thick. The upper 5 inches of the underlying material is pale-brown gravelly sandy clay loam that contains thin strata of loamy sand and loam. The lower 15 inches is light yellowish-brown, loose loamy sand that is about 15 percent caliche gravel.

Gageby soils are well drained and have high available water capacity.

Typical profile of Gageby clay loam, about 4.2 miles north of New Mobeetie by Farm Road 48, or 1.8 miles south of the Hemphill County line on Farm Road 48, then 0.1 mile east in a pasture:

A11—0 to 7 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, fine and medium, granular structure; hard, friable; few fine pores; common worm casts; few thin strata of lighter colored material; calcareous; moderately alkaline; clear, smooth boundary.

A12—7 to 20 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak, fine and medium, subangular blocky structure; hard, friable; many worm casts; thin strata of loam and very fine sandy loam; calcareous; moderately alkaline; gradual, smooth boundary.

A13—20 to 36 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, granular and weak, fine, subangular blocky structure; hard, friable; many worm casts; calcareous; moderately alkaline; clear, smooth boundary.

B—36 to 45 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak, fine, subangular blocky structure; hard, friable; few fine films and threads and very fine soft masses of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

IIC1ca—45 to 50 inches, pale-brown (10YR 6/3) gravelly sandy clay loam, brown (10YR 5/3) moist; massive; hard, friable; few soft masses and concretions of calcium carbonate; about 30 percent water-rounded caliche gravel 2 to 15 millimeters in diameter; thin strata of loamy sand and loam; calcareous; moderately alkaline; clear, smooth boundary.

IIC2ca—50 to 65 inches, light yellowish-brown (10YR 6/4) loamy sand, yellowish brown (10YR 5/4) moist; massive; loose; 15 percent water-rounded caliche gravel.

The A horizon is brown, grayish brown, dark grayish brown, or dark brown and ranges from 24 to 40 inches in thickness. The B horizon is brown or yellowish brown. It ranges from 8 to 20 inches in thickness and is loam or clay loam. Depth to the C horizon ranges from 35 to 50 inches. The C horizon is very pale brown or light yellowish brown. It is sandy clay loam, fine sandy loam, loamy sand, or loam. The content of gravel in the C horizon ranges from 0 to 30 percent.

Gageby clay loam (Ga).—This nearly level to gently sloping soil occupies flood plains of creeks and major drainageways. This soil is low lying, and most areas are subject to occasional floods that overflow briefly at intervals of about 4 years. Most areas are less than 1,000 feet wide and are elongated up and down the drainageways. The slope is less than 2 percent and is dominantly about 0.6 percent.

Included with this soil in mapping are areas of Bippus, Sweetwater, Guadalupe, Lincoln, and Clairemont soils. Also included are small areas of a soil that is similar to Gageby soils but has a darkened surface layer less than 20 inches thick.

This soil is used for crops and range. Some areas are irrigated. This soil receives extra water and fresh soil deposition as each flood occurs. The hazard of soil blow-

ing is slight. Capability unit IIc-1, dryland; capability unit I-2, irrigated; Loamy Bottomland range site.

Grandfield Series

The Grandfield series consists of deep, moderately permeable soils on uplands. These soils formed in sandy and loamy material.

These soils typically have a surface layer of brown fine sandy loam about 8 inches thick. The next layer is reddish-brown sandy clay loam in the upper 30 inches and reddish-brown fine sandy loam in the lower 22 inches. The underlying material is reddish-yellow fine sandy loam in the upper 8 inches and reddish-yellow loamy sand in the lower 12 inches. The lower part contains a few quartz pebbles.

Grandfield soils are well drained and have high available water capacity.

Typical profile of Grandfield fine sandy loam, 1 to 3 percent slopes, 2.5 miles west on Texas Highway 152 from its junction with Farm Road 48 in Mobeetie, then 100 feet north in a cultivated field:

Ap—0 to 8 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak granular structure; slightly hard, very friable; neutral; abrupt, wavy boundary.

B21t—8 to 22 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate, very coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, friable; few very fine quartz pebbles; few thin clay films on ped surfaces; neutral; gradual, smooth boundary.

B22t—22 to 38 inches, reddish-brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate, very coarse, prismatic structure parting to moderate, fine, subangular blocky; very hard, friable; few fine quartz pebbles; few thin clay films on ped surfaces; neutral; gradual, smooth boundary.

B3—38 to 60 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky structure; hard, very friable; mildly alkaline; gradual, wavy boundary.

C1—60 to 68 inches, reddish-yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; massive; hard, very friable; mildly alkaline; gradual, wavy boundary.

C2—68 to 80 inches, reddish-yellow (7.5YR 8/6) loamy sand, reddish yellow (7.5YR 7/6) moist; massive; loose; few fine quartz pebbles; mildly alkaline.

The A horizon is brown loamy fine sand or fine sandy loam and ranges from 5 to 16 inches in thickness. The Bt horizon is reddish brown or yellowish red. It ranges from 22 to 35 inches in thickness. Structure of the Bt horizon is weak to moderate, fine to very coarse, and subangular blocky to prismatic. The B3 horizon is red, reddish brown, reddish yellow, or yellowish red. It ranges from 6 to 30 inches in thickness and from fine sandy loam to sandy clay loam. Depth to the C horizon ranges from 34 to 60 inches. It is reddish yellow, brown, yellowish red, red, pink, strong brown, or light brown. The C horizon is calcareous in about 35 percent of the areas. It is loamy sand, loamy fine sand, or fine sandy loam.

Grandfield loamy fine sand, 0 to 3 percent slopes (GdB). —This nearly level to gently undulating soil is on plains, in areas that are several hundred acres in size. The slope is dominantly about 1.5 percent. The soil is undulating in some places.

This soil has a surface layer of brown loamy fine sand about 15 inches thick. The next layer is reddish-brown sandy clay loam in the upper 25 inches and reddish-yellow sandy clay loam in the lower 14 inches. The underlying material is reddish-yellow loamy fine sand.

Included with this soil in mapping are areas of Grandfield fine sandy loam soils and areas of Devol, Delwin, and Altus soils. Also included are areas in which a buried soil occurs below a depth of 40 inches. This buried soil is clay loam that is darker colored than the overlying profile. In some included areas there is caliche or red-bed material below a depth of 40 inches.

This soil is used for crops and range. The hazard of soil blowing is high, and in places along some of the fence rows, there are sand dunes that are 8 to 20 feet wide at the base and 1 to 6 feet high. The hazard of water erosion is only slight. Capability unit IVe-6, dryland; capability unit IIIe-2, irrigated; Sandyland range site.

Grandfield loamy fine sand, 3 to 8 percent slopes (GdD). —This soil is on hillsides and ridges. The areas average about 60 acres in size. The slope is dominantly about 6 percent.

This soil typically has a surface layer of brown loamy fine sand about 9 inches thick. The next layer is reddish-brown sandy clay loam in the upper 11 inches, yellowish-red sandy clay loam in the next 11 inches, and reddish-yellow fine sandy loam in the lower 19 inches. The underlying material is reddish-yellow loamy fine sand.

Included with this soil in mapping are areas of Devol, Mobeetie, and Likes soils and Grandfield fine sandy loam. Also included are small areas of Grandfield loamy fine sand that are severely eroded.

Most of this soil is used for range. The hazard of soil blowing is high, and the hazard of water erosion is moderate. Capability unit VIe-6, dryland; capability unit IVe-2, irrigated; Sandyland range site.

Grandfield fine sandy loam, 0 to 1 percent slopes (GfA). —This soil occupies plane or weakly concave areas that are oval in shape. The slope is dominantly about 0.7 percent.

This soil typically has a surface layer of brown fine sandy loam about 8 inches thick. The next layer is reddish-brown sandy clay loam in the upper 24 inches, yellowish-red sandy clay loam in the next 8 inches, and brown fine sandy loam in the lower 20 inches. The underlying material is reddish-yellow loamy sand.

Included with this soil in mapping are areas of Grandfield loamy fine sand and Altus soils.

This soil is used mostly for crops, but some areas are still in range. Most of these areas receive some outside water. The hazard of soil blowing is moderate. Capability unit IIe-3, dryland; capability unit IIe-4, irrigated; Sandy Loam range site.

Grandfield fine sandy loam, 1 to 3 percent slopes (GfB). —This soil occupies plains that average about 50 acres in size. It has the profile described as typical for the series. The slope is dominantly about 2 percent.

Included with this soil in mapping are a few areas of Grandfield fine sandy loam, 0 to 1 percent slopes, and Grandfield fine sandy loam, 3 to 5 percent slopes. Also included are areas of Grandfield loamy fine sand and Altus soils.

Most of this soil is used for crops, but a few areas are still in range. The hazard of water erosion is slight, and the hazard of soil blowing is moderate. Capability unit IIIe-4, dryland; capability unit IIe-3, irrigated; Sandy Loam range site.

Grandfield fine sandy loam, 3 to 5 percent slopes (GfC).—This soil is on hillsides and ridges, in areas that average about 35 acres in size and are irregular in shape. The slope is dominantly about 3.8 percent.

This soil typically has a surface layer of brown fine sandy loam about 5 inches thick. The next layer is reddish-brown sandy clay loam in the upper 45 inches and reddish-brown fine sandy loam in the lower 10 inches. The underlying material is reddish-yellow loamy sand that contains a few waterworn quartz pebbles.

Included with this soil in mapping are areas of Grandfield loamy fine sand, areas of Veal and Hardeman soils, and small areas of Grandfield fine sandy loam that has slopes of less than 3 percent. Also included are areas of soils that have some waterworn quartz pebbles on the surface.

About two-thirds of this soil is used for range, and the rest is cropland. Because of the slope, most rainfall runs off during heavier rains. The hazards of soil blowing and water erosion are moderate. Capability unit IIIe-4, dryland; capability unit IIIe-3, irrigated; Sandy Loam range site.

Grandfield fine sandy loam, 3 to 5 percent slopes, eroded (GfC2).—This soil is on hillsides and ridges, in areas that average about 25 acres in size. The slope is dominantly about 4.3 percent.

This soil has a surface layer of brown fine sandy loam about 5 inches thick. The next layer is reddish-brown sandy clay loam in the upper 11 inches, yellowish-red sandy clay loam in the next 23 inches, and reddish-yellow fine sandy loam in the lower 11 inches. The underlying material is reddish-yellow loamy sand.

The damage caused by erosion is evident. About one-fourth of the total acreage is slightly eroded by wind and water. On one-sixth of the total acreage, all of the original surface layer is missing. Gullies that have been eroded into the subsoil and underlying material are at intervals of about 80 feet across the slopes. About 25 percent of these gullies are so deep that they cannot be crossed by farm equipment.

Included with this soil in mapping are areas of Hardeman and Veal soils and small areas of Grandfield fine sandy loam that has slopes of less than 3 percent or more than 5 percent.

All of this soil has been cropped or is now used for crops, but many areas have been returned to grass. The hazards of soil blowing and water erosion are moderate. Capability unit IVe-3, dryland; Sandy Loam range site.

Grandfield soils, 3 to 8 percent slopes, severely eroded (GrD3).—The soils in this undifferentiated group are in areas of hillsides and ridges that range from about 20 acres to 100 acres in size. The slope is dominantly about 6.5 percent.

Erosion commonly has removed much of the original surface layer of loamy fine sand, and the present surface layer is loamy fine sand, fine sandy loam, or sandy clay loam. The original surface layer is missing on more than 60 percent of the total acreage, and, on about 50 percent of the acreage, one-half of the sandy clay loam material has been removed by wind and by water. On about 25 percent of the acreage, one-half of the original surface layer of loamy fine sand is missing. The other 15 percent is slightly eroded or consists of blowout pits or gullies. From one mapped area to another, however, the percentage of each of these erosion conditions varies, and soil patterns are irregular. The percentage of the acreage where the original surface layer is missing ranges from 30 to 60 percent. The percentage where one-half of the original surface layer is missing ranges from 15 to 40 percent.

Grandfield loamy fine sand in this mapping unit typically has a surface layer about 5 inches thick. The next layer is reddish-brown sandy clay loam in the upper 30 inches and reddish-brown fine sandy loam in the lower 20 inches. The underlying material is reddish-yellow loamy sand.

Crossable and uncrossable gullies are common. The uncrossable gullies have been eroded into the underlying material. The largest gullies have vertical sides and are 12 feet deep and 10 feet wide. The blowout pits within these areas average about 75 feet across and 150 feet in length, and they range from 2 to 10 feet in depth. Sand dunes that are several feet high are on one or more sides of each pit. These pits and accompanying sand dunes are devoid of most vegetation.

Included with this soil in mapping are areas of Likes, Devol, Delwin, and Hardeman soils.

This mapping unit is not suited to crops. Most areas have been returned to range and reseeded mainly to native grasses. The stands of reseeded grasses are thin in some areas. The hazards of soil blowing and water erosion are high. Capability unit VIe-6, dryland; Sandyland range site.

Guadalupe Series

The Guadalupe series consists of deep, moderately rapidly permeable soils on bottom lands. These soils formed in loamy, calcareous, alluvial sediment.

These soils typically have a surface layer of brown fine sandy loam about 10 inches thick. The next layer is dark grayish-brown fine sandy loam in the upper 4 inches, brown fine sandy loam in the next 22 inches, and grayish-brown clay loam in the lower 18 inches. The underlying material is brown sandy loam that contains a few caliche pebbles.

Guadalupe soils are well drained and have moderate available water capacity.

Typical profile of Guadalupe fine sandy loam, 3.4 miles west on a county road from its junction with Farm Road 48 in the southwest corner of the New Mobeetie townsite, then 60 feet north in a cultivated field:

Ap—0 to 10 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak, medium, subangular blocky structure parting to weak, fine, granular; slightly hard, very friable; common worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

B21—10 to 14 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak, medium, subangular blocky structure;

hard, very friable; many worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

B22—14 to 36 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak, fine, subangular blocky structure; slightly hard, very friable; weakly stratified, lenses of loamy sand and sandy clay loam; calcareous; moderately alkaline; abrupt, smooth boundary.

B3—36 to 54 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak, medium, granular structure; hard, friable; calcareous; moderately alkaline; abrupt, smooth boundary.

C—54 to 65 inches, brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable; few fine caliche pebbles; weakly stratified; calcareous; moderately alkaline.

The A horizon is brown, grayish brown, or dark grayish brown and ranges from 4 to 19 inches in thickness. The B2, B3, and C horizons are dark grayish brown, yellowish brown, brown, grayish brown, or pale brown. Depth to the C horizon ranges from 24 to 55 inches. The C horizon ranges from loamy sand to clay loam. The content of calcium carbonate varies from a few films and threads to a few fine caliche pebbles.

Guadalupe fine sandy loam (Gu).—This nearly level to gently sloping soil is on flood plains of creeks and major drainageways. The surface is weakly undulating. Because most areas of this soil are low lying, they are subject to occasional but brief flooding in about 1 year in 4. Each flood leaves a thin layer of fresh alluvial material on the soil surface. Most areas are less than 1,000 feet wide and are elongated up and down the drainageways. In areas where this soil is adjacent to streams, it is only a few feet above the channel. The slope is as much as 2 percent but is dominantly about 0.7 percent.

Included with this soil in mapping are areas of Gageby and Lincoln soils and small stream channels.

This soil is used for crops and range. The hazard of soil blowing is moderate. Capability unit IIe-3, dryland; capability unit I-3, irrigated; Loamy Bottomland range site.

Gypsum Outcrop

Gypsum outcrop consists of gently sloping areas of rocky material exposed at the surface. In some areas less than 4 inches of soil material covers the rocky material.

Gypsum outcrop and Quinlan soils, undulating (GyC).—This undifferentiated group is in large, gently undulating, convex areas where gypsum rock crops out in the erosional red beds (fig. 11). The slope ranges from 1 to 5 percent but is dominantly about 4.5 percent.

The composition of this mapping unit is more variable and the areas are generally much larger than those of most other units in the county. Mapping has been controlled well enough, however, for the anticipated uses of the soils.

About 70 percent of the mapping unit is Gypsum outcrop, 15 percent is Quinlan soil, and 15 percent is other land types and included soils. From one mapped area to another, however, the percentage of Gypsum outcrop and Quinlan soil varies. Gypsum outcrop makes up 40 to 80 percent of the acreage, and the Quinlan soil 5 to 45 percent. The Quinlan soil is in convex to plane areas between convex areas of Gypsum outcrop. The patterns are not uniform, and they occur without regularity.

Gypsum outcrop varies from a soft, powdery material to hard rock. The Quinlan soil has a surface layer of reddish-yellow, calcareous silt loam about 7 inches thick. The next layer is red silt loam about 5 inches thick. The underlying material is weakly cemented sandstone.

Included with this unit in mapping are areas of Rough broken land and areas of Carey, Lutie, Cottonwood, and Clairemont soils.

This mapping unit is used for range. Active geological erosion is cutting into the gypsum and the Quinlan soil in this unit. Gypsum outcrop is in capability unit VIIs-1, dryland, and Gypland range site. The Quinlan soil is in capability unit VIe-4, dryland, and Mixedland range site.

Hardeman Series

The Hardeman series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in loamy, calcareous material.

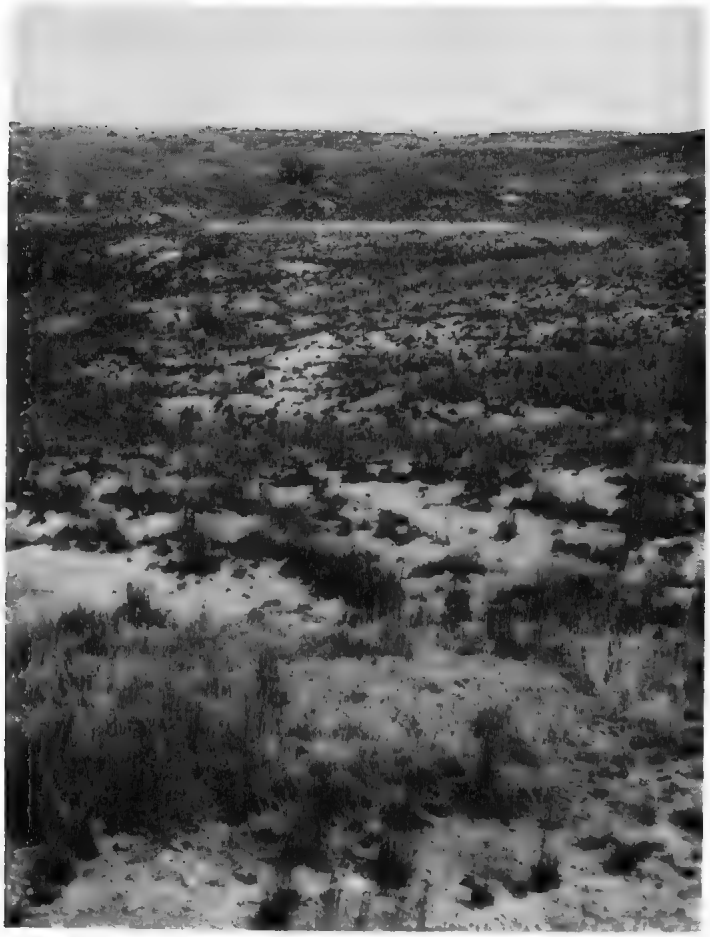

Figure 11.—**Area of Gypsum outcrop and Quinlan soils, undulating.**

These soils typically have a surface layer of brown fine sandy loam about 8 inches thick. The next layer also is brown fine sandy loam in the upper 16 inches but is light-brown fine sandy loam in the lower 24 inches. The underlying material is a pink loamy fine sand.

Hardeman soils are well drained and have moderate available water capacity.

Typical profile of Hardeman fine sandy loam, 5 to 8 percent slopes, 7.0 miles east on Texas Highway 152 from its junction in Wheeler with U.S. Highway 83, then 1.6 miles north on a county road, then 0.1 mile east in native range:

A1—0 to 8 inches, brown (7.5YR 4/3) fine sandy loam, dark brown (7.5YR 3/3) moist; moderate, medium, granular structure; slightly hard, very friable; common worm casts; mildly alkaline; gradual, smooth boundary.

B21—8 to 24 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak, medium, prismatic structure parting to weak, fine, subangular blocky; hard, very friable; common worm casts; mildly alkaline; gradual, smooth boundary.

B22—24 to 48 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak, medium, subangular blocky structure; slightly hard, very friable; few worm casts; few films and very fine soft masses of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—48 to 80 inches, pink (7.5YR 7/4) loamy fine sand, brown (7.5YR 5/4) moist; single grained; soft, loose; few films, soft masses, and fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown or dark brown and ranges from 6 to 12 inches in thickness. The B horizon is light brown, brown, reddish brown, or reddish yellow. These soils become calcareous between depths of 10 and 34 inches. Depth to the C horizon ranges from 25 to 54 inches. The C horizon is pink, light yellowish brown, strong brown, light brown, reddish yellow, reddish brown, brown, or very pale brown. It is loamy fine sand or fine sandy loam.

Hardeman fine sandy loam, 3 to 5 percent slopes (HaC).—This soil is on ridges and hillsides, in areas that average about 40 acres in size and range from irregular to oval in shape. The slope is dominantly about 4.3 percent.

This soil typically has a surface layer of brown fine sandy loam about 12 inches thick. The next layer is brown fine sandy loam about 36 inches thick. The underlying material is reddish-yellow fine sandy loam.

Included with this soil in mapping are areas of Devol, Veal, Mobeetie, and Grandfield soils. Also included are areas of a soil that is similar to this Hardeman soil but is noncalcareous to a depth of 48 inches.

This soil is used for crops and range. The hazards of soil blowing and water erosion are moderate. Capability unit IVe-4, dryland; capability unit IIIe-5, irrigated; Sandy Loam range site.

Hardeman fine sandy loam, 5 to 8 percent slopes (HaD).—This soil is in convex areas that average about 60 acres in size and are irregular in shape. It has the profile described as typical for the series. The slope is dominantly about 7 percent.

Included with this soil in mapping are areas of Devol, Mobeetie, Veal, and Grandfield soils.

This soil is used mostly for range. The hazard of soil blowing is moderate, and the hazard of water erosion is high. Capability unit VIe-5, dryland; Sandy Loam range site.

Likes Series

The Likes series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in sandy outwash and eolian material.

These soils typically have a surface layer of brown loamy fine sand about 5 inches thick. The upper 11 inches of the underlying material is pale-brown loamy sand, and the lower 44 inches is very pale brown loamy sand.

Likes soils are excessively drained and have low available water capacity.

Typical profile of Likes loamy fine sand, 1 to 4 percent slopes, 300 feet north of the railroad station in Briscoe, in native range:

A1—0 to 5 inches, brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak, medium, granular structure; soft, very friable; few quartzite pebbles; few fine concretions of calcium carbonate on the surface and in the horizon; calcareous; moderately alkaline; gradual, wavy boundary.

C1—5 to 16 inches, pale-brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grained; soft, loose; few quartzite pebbles; few fine concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

C2—16 to 60 inches, very pale brown (10YR 7/4) loamy sand, light yellowish brown (10YR 6/4) moist; single grained; loose; few fine quartzite pebbles; few fragments of weakly cemented sandstone; few fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown, grayish brown, light brownish gray, or pale brown. It ranges from 5 to 15 inches in thickness. The C horizon is very pale brown, pink, brown, or pale brown. It is loamy fine sand, loamy sand, or sand.

Likes loamy fine sand, 1 to 4 percent slopes (LkB).—Most of this soil is in convex areas on the sides of valleys. These areas are rounded or oblong in shape and average about 80 acres in size. The surface is undulating. The slope is dominantly about 3.5 percent.

Included with this soil in mapping are areas of Mobeetie, Veal, Tivoli, Lincoln, and Potter soils.

This soil is used for range. The hazard of soil blowing is high. Capability unit VIe-6, dryland; Sandyland range site.

Lincoln Series

The Lincoln series consists of deep, rapidly permeable soils on bottom lands. These soils formed in calcareous alluvial material.

These soils typically have a surface layer of dark grayish-brown loamy fine sand about 6 inches thick. The underlying material is pale-brown fine sand to a depth of 18 inches; very pale brown, stratified fine sand to a depth of 55 inches; and pink fine sand to a depth of 65 inches. A water table is at a depth of 60 inches.

Lincoln soils are somewhat excessively drained and have low available water capacity.

Typical profile of Lincoln loamy fine sand in an area of Lincoln soils, 12.4 miles east on Texas Highway 152

from its junction in Wheeler with U.S. Highway 83, then 0.4 mile northeast on a county road, then 100 feet north in a native pasture:

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak, fine and medium, granular structure; soft, very friable; common worm casts; few lenses of sand; calcareous; moderately alkaline; clear, smooth boundary.

C1—6 to 18 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; massive; loose; few distinct bedding planes of loamy fine sand to clay loam as much as ½ inch thick; calcareous; moderately alkaline; clear, smooth boundary.

C2—18 to 55 inches, very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3) moist; massive; loose; many distinct bedding planes of loamy fine sand to sandy clay loam as much as ½ inch thick; bedding planes decrease in thickness and frequency as depth increases; calcareous; moderately alkaline; abrupt, smooth boundary.

C3—55 to 65 inches, pink (7.5YR 8/4) fine sand, pink (7.5YR 7/4) moist; massive; loose; few, thin, faint bedding planes of loamy fine sand to loam; water table at depth of about 60 inches; calcareous; moderately alkaline.

The A horizon is brown, pale brown, dark grayish brown, dark brown, very pale brown, light yellowish brown, or grayish brown. It ranges from 6 to 15 inches in thickness and from silt loam to loamy sand. The C horizon is very pale brown, pale brown, pink, light yellowish brown, light brownish gray, or white. It is loamy sand, sand, or loamy fine sand. Stratification varies from faint to distinct, and lenses are as much as 1 inch thick.

Lincoln soils (Ln).—These nearly level to gently sloping soils are on flood plains adjacent to the major rivers and creeks. The areas range from small to large and depend on the size of the stream or river to which they are adjacent. The surface is undulating. The soils are low lying, and most areas are subject to occasional flooding, mainly of short duration. Each flood scours the soil surface in some places, and it leaves a thin layer of fresh soil material on the surface in other places. The slope ranges from 0 to 2 percent but is dominantly about 0.7 percent.

Included with these soils in mapping are areas of Sweetwater, Guadalupe, Tivoli, Likes, Gageby, and Clairemont soils.

These soils are used for range. A water table is between depths of 4 and 10 feet in some areas. The hazard of soil blowing is severe. Capability unit Vw-2, dryland; Sandy Bottomland range site.

Lutie Series

The Lutie series consists of deep, moderately permeable soils on uplands. These soils formed in loamy, red-bed material.

These soils typically have a surface layer of reddish-brown silt loam about 11 inches thick. The next layer extends to a depth of 80 inches. In sequence from the top, this layer is 5 inches of reddish-brown silty clay loam, 14 inches of red silty clay loam that is about 3 percent visible calcium carbonate, 20 inches of red silt loam, and 30 inches of red silty clay loam.

Lutie soils are well drained and have high available water capacity.

Typical profile of Lutie silt loam, 3 to 5 percent slopes, 3.0 miles north of U.S. Highway 66 in Lela on Farm Road 3075, then 2.2 miles east on a county road, then 50 feet north in native range:

A1—0 to 11 inches, reddish-brown (5YR 4/3) silt loam, dark reddish brown (5YR 3/3) moist; moderate, fine, granular structure; hard, friable; common worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

B1ca—11 to 16 inches, reddish-brown (2.5YR 5/4) silty clay loam, reddish brown (2.5YR 4/4) moist; moderate, fine, granular and subangular blocky structure; hard, friable; few thin clay films on ped faces; 5 percent by volume visible, weakly cemented concretions, coatings, and soft masses of calcium carbonate; 35 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual, smooth boundary.

B21tca—16 to 30 inches, red (2.5YR 5/6) silty clay loam, red (2.5YR 4/6) moist; moderate, fine, subangular blocky structure; hard, friable; common thin clay films on ped faces; few gray masses of very fine sandy loam; 3 percent by volume visible, weakly cemented concretions, coatings, and soft masses of calcium carbonate; 28 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual, smooth boundary.

B22tca—30 to 50 inches, red (2.5YR 5/6) silt loam, red (2.5YR 4/6) moist; moderate, medium, subangular blocky structure; hard, friable; few thin clay films on ped faces; about 10 percent of mass is gypsum and gray and red very fine sandy loam pockets; coatings of calcium carbonate on ped surfaces; 18 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual, smooth boundary.

B23tca—50 to 80 inches, red (2.5YR 5/6) silty clay loam, red (2.5YR 4/6) moist; moderate, medium, blocky structure; very hard, firm; few thin clay films on most ped faces; few calcium carbonate coatings; about 6 percent by volume gray siltstone; few pockets of red very fine sandy loam; 25 percent calcium carbonate equivalent; calcareous; moderately alkaline.

The A horizon is brown, reddish brown, or dark grayish brown silt loam or silty clay loam. It ranges from 11 to 14 inches in thickness. The B1ca horizon is brown, reddish brown, yellowish red, or strong brown silt loam or silty clay loam. It is as much as 7 inches thick. The Btca horizon extends to a depth ranging from 60 inches to more than 80 inches. The Btca horizon is reddish brown, light red, red, yellowish red, reddish yellow, or light reddish brown. The B22tca horizon is silt loam or silty clay loam. Structure of the B22tca horizon is weak to moderate, fine to medium, prismatic to blocky.

Lutie silt loam, 1 to 3 percent slopes (LuB).—This soil is in plane and convex areas on ridges. These areas are irregular in shape and average about 50 acres in size. The slope is dominantly about 2.2 percent.

This soil typically has a surface layer of brown silt loam about 12 inches thick. The next layer is reddish-brown silt loam in the upper 7 inches, reddish-brown silty clay loam in the next 32 inches, and red silty clay loam in the lower part.

Included with this soil in mapping are areas of Carey, Paducah, Obaro, and Dodson soils.

This soil is used for crops and for range. The hazards of water erosion and soil blowing are slight. Capability unit IIIe-1, dryland; capability unit IIIe-1, irrigated; Mixedland range site.

Lutie silt loam, 3 to 5 percent slopes (LuC).—This soil is on ridges and sides of hills and drainageways. It has

the profile described as typical for the series. The areas are irregular in shape and less than 150 acres in size. The slope is dominantly about 4 percent.

Included with this soil in mapping are areas of Obaro, Paducah, Carey, and Quinlan soils.

This soil is used mostly for range, but a few areas are in crops. The hazard of water erosion is moderate, and the hazard of soil blowing is slight. Capability unit IIIe-3, dryland; capability unit IIIe-4, irrigated; Mixedland range site.

Lutie and Cottonwood soils, 1 to 4 percent slopes (LwB).—The soils in this undifferentiated group are in irregularly shaped areas that range from 20 to more than 500 acres in size. The surface is undulating. The slope is dominantly about 3 percent.

About 40 percent of this mapping unit is Lutie silt loam, 35 percent is Cottonwood soil, and 25 percent is included soils and land types. From one mapped area to another, however, the percentage of Lutie and Cottonwood soils varies. The Lutie soil makes up 25 to 65 percent of the areas, and the Cottonwood soil 20 to 60 percent. The Lutie soil is in concave to plane positions below the Cottonwood soil, which is on convex knobs and ridges. The soil patterns are not uniform and occur without regularity.

The Lutie soil has a surface layer of brown silt loam about 12 inches thick. The upper 7 inches of the next layer is reddish-brown silty clay loam that is about 5 percent visible calcium carbonate; the lower part is reddish-brown silty clay loam. The Cottonwood soil has the profile described as typical for the Cottonwood series.

Included with these soils in mapping are areas of Dodson, Carey, Obaro, and Quinlan soils and Gypsum outcrop.

This mapping unit is used mostly for range. The soils are not well suited to crops. A few small fields of the Lutie soil are cultivated to crops that provide supplemental feed for livestock. Lutie soil is in capability unit VIe-4, dryland, and Mixedland range site. Cottonwood soil is in capability unit VIIs-1, dryland, and Gypland range site.

Mansker Series

The Mansker series consists of deep, moderately permeable soils on uplands. These soils formed in loamy sediment.

These soils typically have a surface layer of dark grayish-brown loam about 10 inches thick. The next layer extends to a depth of 73 inches. In sequence from the top, this layer is 3 inches of brown clay loam, 17 inches of light-brown clay loam that is about 20 percent visible carbonate, 30 inches of reddish-yellow clay loam, and 13 inches of reddish-yellow loam.

Mansker soils are well drained and have high available water capacity.

Typical profile of Mansker loam in an area of Mansker and Portales soils, 3 to 5 percent slopes (fig. 12), 2.25 miles northwest on Farm Road 48 from its junction in New Mobeetie with Farm Road 1046, then 3 miles west and 1.15 miles north on county roads, then 50 feet east in range:

A1—0 to 10 inches, dark grayish-brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure parting to moderate, fine, granular; hard, friable; common worm casts; calcareous; moderately alkaline; clear, smooth boundary.

B21—10 to 13 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate, coarse, prismatic

Figure 12.—**Profile of Mansker loam, showing calcium carbonate accumulations.**

structure parting to moderate, very fine, subangular blocky; hard, friable; common worm casts; few threads, films, and fine concretions of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B22ca—13 to 30 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; few worm casts; about 20 percent by volume visible threads, films, and medium to very fine soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

B23tbca—30 to 60 inches, reddish-yellow (7.5YR 7/6) clay loam, reddish yellow (7.5YR 6/6) moist; weak, fine, subangular blocky structure; hard, friable; few clay films on ped faces; about 10 percent medium to very fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

B24tb—60 to 73 inches, reddish-yellow (7.5YR 7/6) loam, reddish yellow (7.5YR 6/6) moist; weak, medium, subangular blocky structure; hard, friable; few clay films on ped faces; about 2 percent very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon is dark grayish brown or brown loam or clay loam and ranges from 7 to 14 inches in thickness. The B21 horizon is light brownish gray or brown loam or clay loam. It ranges from 3 to 8 inches in thickness. Depth to the B22ca horizon ranges from 12 to 20 inches. The B22ca horizon is light brown, reddish yellow, yellowish red, or red and ranges from 12 to 20 inches in thickness. The B2tb horizon extends to a depth of more than 60 inches. It is reddish yellow, strong brown, light brown, pink, or light yellowish brown and is loam, clay loam, or sandy clay loam.

Mansker and Portales soils, 1 to 3 percent slopes (MaB).—The soils in this undifferentiated group are on ridges and in convex areas along drainageways. The areas average only about 30 acres in size. The slope is dominantly about 2 percent.

About 50 percent of this mapping unit is Mansker soil, 40 percent is Portales soil, and 10 percent is included soils. From one mapped area to another, however, the percentage of Mansker and Portales soils varies. The Mansker soil makes up 30 to 70 percent of the areas, and the Portales soil 20 to 60 percent. The Mansker soil is in weakly convex to plane areas, and the Portales soil is in plane to weakly concave areas. The soil patterns are not uniform and occur without regularity.

The Mansker soil has a surface layer of dark grayish-brown loam about 8 inches thick. The next layer in sequence from the top is 12 inches of light-brown clay loam, 15 inches of pink clay loam that is about 20 percent visible calcium carbonates, and 15 inches of reddish-yellow clay loam. Below this it is strong-brown sandy clay loam.

The Portales soil has a surface layer of dark grayish-brown, calcareous clay loam about 12 inches thick. The next layer is brown clay loam in the upper 13 inches and, in the lower 16 inches, pink clay loam that is about 20 percent visible calcium carbonate. The underlying material is very pale brown clay loam.

Included with these soils in mapping are areas of Abilene, Veal, and Potter soils and small areas of Mansker and Portales soils that have slopes of 0 to 1 percent and slopes of 3 to 5 percent.

This mapping unit is used for range and for crops. The hazards of soil blowing and water erosion are slight. Mansker soil is in capability unit IIIe-1, dryland; capability unit IIIe-1, irrigated; and Hardland Slopes range site. Portales soil is in capability unit IIIe-1, dryland; capability unit IIe-2, irrigated; and Hardland Slopes range site.

Mansker and Portales soils, 3 to 5 percent slopes (MaC).—The soils in this undifferentiated group are on ridges and hillsides and along drainageways. The areas range from 20 to 100 acres in size and are irregular in shape. The slope is dominantly about 4.2 percent.

About 50 percent of this unit is Mansker soil, 40 percent is Portales soil, and 10 percent is other soils. From one mapped area to another, however, the percentage of Mansker and Portales soils varies. The Mansker soil makes up 30 to 70 percent of the areas, and the Portales soil 20 to 60 percent. The Mansker soil is in convex areas and on ridges and hillsides. The Portales soil occupies plane to weakly concave areas. Soil patterns are not uniform and they occur without regularity.

The Mansker and Portales soils in this mapping unit have the profile described as typical for their series.

Included with these soils in mapping are areas of Potter, Veal, Berda, and Abilene soils and small areas of Mansker and Portales soils that have slopes of less than 3 percent.

Most of this mapping unit is used for range, but some areas are cropped. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Both soils are in capability unit IVe-2, dryland; capability unit IVe-1, irrigated; and Hardland Slopes range site.

Mobeetie Series

The Mobeetie series consists of deep, moderately rapidly permeable soils on uplands. These soils formed in loamy, calcareous material.

These soils typically have a surface layer of grayish-brown, calcareous fine sandy loam about 9 inches thick. The next layer is brown fine sandy loam in the upper 13 inches and very pale brown fine sandy loam in the lower 14 inches. The lower part contains threads and films of calcium carbonate. The underlying material is pink loamy fine sand.

Mobeetie soils are well drained and have moderate available water capacity.

Typical profile of Mobeetie fine sandy loam, 5 to 8 percent slopes, 5 miles north of the courthouse in Wheeler on U.S. Highway 83, then 3 miles west on a county road, then 50 feet north into an old field:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate, fine, granular structure; slightly hard, very friable; few worm casts; few fine quartzite pebbles; few fine fragments of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B21—9 to 22 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak, fine and medium, subangular blocky structure; slightly hard, very friable; common worm casts; common fine and medium quartzite pebbles; common fine fragments, films, threads, and soft masses of calcium car-

bonate; calcareous; moderately alkaline; clear, smooth boundary.

B22—22 to 36 inches, very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak, fine, subangular blocky structure; slightly hard, very friable; common fine quartzite pebbles; common fine and medium fragments, threads, and films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C—36 to 60 inches, pink (7.5YR 7/4) loamy fine sand, light brown (7.5YR 6/4) moist; single grained; loose; common fine quartzite pebbles; common fine and medium fragments of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 6 to 20 inches in thickness. It is brown, pale brown, light brownish gray, or grayish brown and ranges from fine sandy loam to light loam. The B21 horizon is brown, pale brown, very pale brown, grayish brown, light brownish gray, or light yellowish brown. It ranges from 10 to 22 inches in thickness. A weakly formed B22ca horizon occurs in about 80 percent of the areas. It is very pale brown, light reddish brown, light brown, or pink. Depth to the C horizon ranges from 24 to 48 inches. The C horizon is pink, pinkish white, reddish yellow, very pale brown, light reddish brown, light brown, yellowish brown, or light yellowish brown. It is fine sandy loam, loamy fine sand, or loamy sand.

Mobeetie fine sandy loam, 1 to 5 percent slopes (MrC).—This soil occupies convex, concave, or plane areas that are generally less than 50 acres in size and are irregularly shaped. The slope is dominantly about 3.5 percent.

This soil typically has a surface layer of grayish-brown, calcareous fine sandy loam about 8 inches thick. The next layer is brown fine sandy loam in the upper 10 inches and very pale brown fine sandy loam in the lower 22 inches. The lower part is about 2 percent visible calcium carbonate. The underlying material is very pale brown fine sandy loam.

Included with this soil in mapping are areas of Veal, Devol, Likes, Potter, Guadalupe, Hardeman, and Grandfield soils. Also included are a few small areas of a soil that is similar to this Mobeetie soil but has a thick, dark surface layer.

This soil is used for both range and crops. The hazards of soil blowing and water erosion are moderate. Capability unit IVe-4, dryland; Sandy Loam range site.

Mobeetie fine sandy loam, 5 to 8 percent slopes (MrD).—This soil occupies convex, concave, or plane areas that range from 30 to more than 100 acres in size and are irregularly shaped. It has the profile described as typical for the series. The slope is dominantly about 7 percent.

Included with this soil in mapping are areas of Likes, Hardeman, Veal, and Devol soils and areas of soils that have slopes of less than 5 percent.

Most of this soil is in range. The hazard of soil blowing is moderate, and the hazard of water erosion is high. Capability unit VIe-3, dryland; Sandy Loam range site.

Mobeetie and Potter soils, rolling (MsD).—The soils in this undifferentiated group are in large, irregularly shaped areas. Many small drainageways dissect these areas. The slope ranges from 3 to 16 percent and is dominantly about 8 percent.

The composition of this mapping unit is more variable and the areas are generally much larger than those of most other units in the county. Mapping has been controlled well enough, however, for the anticipated uses of the soils.

About 52 percent of the mapping unit is Mobeetie soil, 27 percent is Potter soil, and 21 percent is included soils. From one mapped area to another, however, the percentage of Mobeetie and Potter soils varies. The Mobeetie soil makes up 30 to 70 percent of the areas, and the Potter soil 20 to 40 percent. The Mobeetie soil is in convex to concave positions below the Potter soil, which is on knobs and ridges.

The Mobeetie soil has a surface layer of brown, calcareous fine sandy loam about 12 inches thick. The next layer is grayish-brown fine sandy loam about 22 inches thick. The underlying material is yellowish-brown fine sandy loam.

The Potter soil has a surface layer of brown, calcareous fine sandy loam about 6 inches thick. The next layer is light brownish-gray, slightly platy caliche, about 7 inches thick, that is about 30 percent loam. The underlying material is white caliche that is about 50 percent platy caliche rock and 50 percent loamy material.

Included with these soils in mapping are small areas of Berda, Veal, Mansker, Guadalupe, and Bippus soils. Also included are a few small areas of Mobeetie and Potter soils that have slopes of more than 16 percent.

This mapping unit is used for range. The steep slopes, the shallow depth to caliche in the Potter soil, the mixture of very shallow and deep soils, and the hazard of erosion make these areas difficult to manage. The hazard of water erosion is high. Mobeetie soil is in capability unit VIe-3, dryland, and Sandy Loam range site. Potter soil is in capability unit VIIs-1, dryland, and Very Shallow range site.

Obaro Series

The Obaro series consists of deep to moderately deep, moderately permeable soils on uplands. These soils formed in loamy material.

These soils typically have a surface layer of reddish-brown, calcareous silt loam about 8 inches thick. The next layer is yellowish-red silt loam in the upper 13 inches and light reddish-brown silt loam in the lower 10 inches. The lower part has coatings of calcium carbonate on the peds. The underlying material is red, weakly cemented sandstone.

Obaro soils are well drained and have moderate available water capacity.

Typical profile of Obaro silt loam, 3 to 5 percent slopes, eroded, 2.0 miles east and 1.0 mile north of U.S. Highway 83 in Twitty on Farm Road 592, then 0.15 mile west on a county road, then 300 feet north in an old field:

Ap—0 to 8 inches, reddish-brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak, medium, granular structure; hard, friable; few fine fragments of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B21—8 to 21 inches, yellowish-red (5YR 5/6) silt loam, yellowish red (5YR 4/6) moist; moderate, fine, subangular blocky structure; hard, friable; com-

mon worm casts; few films, fine soft masses, and fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22ca—21 to 31 inches, light reddish-brown (2.5YR 6/4) silt loam, reddish brown (2.5YR 5/4) moist; weak, medium, subangular blocky structure; hard, friable; common coatings of calcium carbonate on ped faces; about 8 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual, wavy boundary.

C—31 to 65 inches, red (2.5YR 5/6), weakly cemented sandstone of very fine sandy loam, red (2.5YR 4/6) moist; few, fine, gray splotches; calcareous; moderately alkaline.

The A horizon is brown or reddish brown and ranges from 5 to 12 inches in thickness. The A and B2 horizons are very fine sandy loam or silt loam. The B21 horizon is reddish brown, reddish yellow, yellowish red, or light reddish brown. It ranges from 8 to 22 inches in thickness. Structure of the B21 horizon is weak or moderate, fine or medium, prismatic or subangular blocky. The B22ca horizon is light reddish brown or reddish yellow and ranges from 6 to 14 inches in thickness. Depth to the C horizon ranges from 20 to 48 inches. The C horizon is red, light red, light reddish brown, reddish yellow, or yellowish red. The sandstone material is very fine sandy loam or silt loam.

Obaro silt loam, 3 to 5 percent slopes, eroded (ObC2).—This soil occupies convex areas that average about 25 acres in size. It has the profile described as typical for the series. The slope is dominantly about 4.5 percent.

The damage caused by erosion is evident. In about 70 percent of most areas, most of the original surface layer is missing. The subsoil and underlying material are exposed in about 30 percent of most areas. Uncrossable gullies occur at intervals of about 100 feet across the slopes; they are as much as 6 feet deep and 10 feet across.

Included with this soil in mapping are areas of Lutie, Paducah, and Quinlan soils. Also included are small areas of uneroded Obaro silt loam.

All areas of this soil have been or now are in cultivation, but most areas have been returned to adapted native and introduced grasses. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. Capability unit IVe-2, dryland; Mixedland range site.

Obaro and Quinlan soils, rolling (OuD).—The soils in this undifferentiated group are in areas that range from 30 acres to more than 1,000 acres in size and are irregular in shape. Many small drainageways dissect these areas. Slopes range from 5 to 12 percent but are dominantly about 8 percent.

The composition of this mapping unit is more variable and the areas are generally much larger than those of most other units in the county. Mapping has been controlled well enough, however, for the anticipated uses of the soils.

About 57 percent of the mapping unit is Obaro soil, 29 percent is Quinlan soil, and 14 percent is other soils. From one mapped area to another, however, the percentage of Obaro and Quinlan soils varies. The Obaro soil makes up 40 to 70 percent of the areas, and the Quinlan soil 15 to 40 percent. The Obaro soil is in plane, weakly convex, and concave positions below the Quinlan soil, which is on ridges, knobs, and other convex areas. Soil patterns are not uniform and occur without regularity.

The Obaro soil has a surface layer of brown, calcareous silt loam about 12 inches thick. The next layer is reddish-brown silt loam in the upper 23 inches and, in the lower 11 inches, reddish-yellow silt loam that has calcium carbonate coatings on the peds. The underlying material is yellowish-red, weakly cemented sandstone. The Quinlan soil has the profile described as typical for the Quinlan series.

Included with these soils in mapping are areas of Lutie, Paducah, Carey, Cottonwood, and Clairemont soils and Rough broken land and Gypsum outcrop.

The complexity of the different soils, the risk of erosion, shallow depth, and steep slopes limit the use of this mapping unit to range. The hazard of soil blowing is slight, but the hazard of water erosion is high. Both Obaro and Quinlan soils are in capability unit VIe-4, dryland, and Mixedland range site.

Paducah Series

The Paducah series consists of deep, moderately permeable soils on uplands. These soils formed in loamy material.

These soils typically have a surface layer of brown silt loam about 8 inches thick. The next layer is red clay loam 22 inches thick. The upper 10 inches of the underlying material is light-red very fine sandy loam that is about 10 percent visible calcium carbonate. The lower 20 inches is red, weakly cemented, calcareous red beds of very fine sandy loam.

Paducah soils are well drained and have high available water capacity.

Typical profile of Paducah silt loam, 1 to 3 percent slopes, 9.0 miles east of Wheeler, 1.0 mile south on Farm Road 592 from its junction with Texas Highway 152, then 100 feet west in a cultivated field:

Ap—0 to 8 inches, brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; moderate, fine, granular structure; slightly hard, very friable; few worm casts; mildly alkaline; clear, smooth boundary.

B21t—8 to 20 inches, red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; weak, very coarse, prismatic structure parting to moderate, fine, subangular blocky; hard, friable; many worm casts; many fine to medium pores; few thin clay films on ped faces; mildly alkaline; diffuse, smooth boundary.

B22t—20 to 30 inches, red (2.5YR 4/6) clay loam, red (2.5YR 4/6) moist; weak, very coarse, prismatic structure parting to moderate, fine, subangular blocky; hard, friable; common worm casts; common fine pores; few thin clay films on ped faces; mildly alkaline; clear, wavy boundary.

Cca—30 to 40 inches, light-red (2.5YR 6/6) very fine sandy loam, red (2.5YR 5/6) moist; massive; slightly hard, very friable; about 10 percent by volume common, fine to medium, soft masses of visible calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

C—40 to 60 inches, red (2.5YR 5/8) very fine sandy loam, red (2.5YR 4/8) moist; massive; partly weathered, weakly cemented red-bed sandstone; calcareous; moderately alkaline.

The A horizon is brown or reddish brown and ranges from 7 to 12 inches in thickness. The Bt horizon is reddish brown, red, or yellowish red silty clay loam or clay loam. It ranges from 16 to 30 inches in thickness. A B3 horizon occurs in about 50 percent of the areas. It is reddish-brown, reddish-yellow, light reddish-brown, red, or yellowish-red loam, silt loam, or silty clay loam. Depth to the Cca horizon

ranges from 28 to 45 inches. The Cca horizon is red, reddish brown, yellowish red, reddish yellow, light red, or light reddish brown. It ranges from very fine sandy loam to silt loam. Depth to the C horizon ranges from 36 to 72 inches. The C horizon is red, reddish yellow, or yellowish red. The crushed red beds are very fine sandy loam, loam, silt loam, or silty clay loam.

Paducah silt loam, 1 to 3 percent slopes (PaB).—This soil is in convex areas that range from 20 to 100 acres in size and are irregular in shape. It has the profile described as typical for the series. The slope is dominantly about 2.2 percent.

Included with this soil in mapping are areas of Obaro, Carey, Quinlan, and Lutie soils.

This soil is used mostly for crops. The hazards of soil blowing and water erosion are slight. Capability unit IIe-1, dryland; capability unit IIe-2, irrigated; Mixedland range site.

Paducah silt loam, 3 to 5 percent slopes (PaC).—This soil occupies convex areas that average about 30 acres in size and are elongated to oval in shape. The slope is dominantly about 4.2 percent.

This soil has a surface layer of brown silt loam about 12 inches thick. The next layer is reddish-brown silty clay loam in the upper 10 inches, reddish-yellow silty clay loam in the next 8 inches, and reddish-yellow silt loam in the lower 13 inches. This lower part is about 10 percent visible calcium carbonate. The underlying material is reddish-yellow, weakly cemented, calcareous silt loam red beds.

Included with this soil in mapping are areas of Carey, Lutie, Quinlan, and Obaro soils and small areas of eroded Paducah silt loam.

This soil is used mostly for crops, but a few areas are in range. Water runs off rapidly during heavy rains. The hazard of water erosion is moderate, and the hazard of soil blowing is slight. Capability unit IIIe-3, dryland; capability unit IIIe-4, irrigated; Mixedland range site.

Portales Series

The Portales series consists of deep, moderately permeable soils on uplands. These soils formed in loamy, calcareous sediment.

These soils typically have a surface layer of grayish-brown, calcareous clay loam about 11 inches thick. The next layer is brown clay loam in the upper 12 inches and pink clay loam in the lower 17 inches. The lower part is about 20 percent visible calcium carbonate. The underlying material is light-brown sandy clay loam.

Portales soils are well drained and have high available water capacity.

In Wheeler County the Portales soils are mapped only in undifferentiated groups with the Mansker soils.

Typical profile of Portales clay loam in an area of Mansker and Portales soils, 3 to 5 percent slopes, 1.0 mile south of the Hemphill County line on Farm Road 48, then 1.2 miles east on a county road, then 0.2 mile south in range:

A1—0 to 11 inches, grayish-brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate, medium, granular structure; hard, friable; many worm casts; common very fine pores; few very fine fragments of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B21—11 to 23 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak, fine, subangular blocky structure; hard, friable; common worm casts; many fine pores; common threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

B22ca—23 to 40 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; weak, fine, subangular blocky structure; hard, friable; few worm casts; about 20 percent films, threads, fine concretions, and soft masses of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

C—40 to 65 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; massive; hard, friable; few films and threads of calcium carbonate; calcareous; moderately alkaline.

The A horizon is dark-brown, grayish-brown, or dark grayish-brown sandy clay loam, loam, or clay loam. It ranges from 11 to 14 inches in thickness. The B21 horizon is brown, pale-brown, or light yellowish-brown loam or clay loam. It ranges from 6 to 16 inches in thickness. Depth to the B22ca horizon ranges from 20 to 30 inches. The B22ca horizon is pink, light yellowish-brown, or light-brown loam or clay loam. It ranges from 8 to 20 inches in thickness. Depth to the C horizon ranges from 30 to 50 inches. The C horizon is pink, light-brown, pale-brown, or very pale brown loam, sandy clay loam, or clay loam.

Potter Series

The Potter series consists of very shallow to shallow, moderately permeable soils on uplands (fig. 13). These soils formed in mixed, loamy, calcareous sediment and caliche.

These soils typically have a surface layer of grayish-brown, calcareous loam about 8 inches thick. The upper 10 inches of the underlying material is white, slightly platy caliche that is about 40 percent clay loam. The lower 42 inches is pink caliche that is about 50 percent platy caliche rock and 50 percent soft powdery caliche and loamy material.

Potter soils are well drained and have low available water capacity.

Typical profile of Potter loam in an area of Potter soils, 1 to 4 percent slopes, 2 miles east of the northwest corner of Wheeler County on Farm Road 1268, then 2 miles south on a county road, then 40 feet west in range:

A1—0 to 8 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate, fine and very fine, subangular blocky structure; slightly hard, friable; few fine pores; few worm casts; common, very fine to medium caliche fragments; calcareous; moderately alkaline; clear, wavy boundary.

C1ca—8 to 18 inches, white (10YR 8/2), slightly platy caliche that has a hardness of slightly less than 3 on Mohs scale; plates are fractured, and undersides have pendants of calcium carbonate; about 40 percent of volume is clay loam; calcareous; moderately alkaline; gradual, wavy boundary.

C2ca—18 to 60 inches, pink (5YR 7/4) caliche; about 50 percent of volume is slightly platy caliche fragments that have a hardness of slightly less than 3 on Mohs scale; about 50 percent of volume is soft powdery caliche and loamy material; calcareous; moderately alkaline.

The A horizon is grayish brown, light brown, brown, or

Figure 13.—**Profile of Potter loam, showing depth to caliche.**

pale brown. It ranges from fine sandy loam to clay loam, and as much as 30 percent of its volume is caliche fragments. Depth to the C1ca horizon ranges from 4 to 12 inches. The C horizon is pink, pinkish white, very pale brown, white, or light brownish gray. It ranges from almost solid platy caliche to mixtures of platy caliche and as much as 50 percent soft powdery caliche and loamy material.

Potter soils, 1 to 4 percent slopes (PoB).—These soils are along convex ridges at the edge of the High Plains and on high ridges extending outward from the edge of the High Plains. Potter loam in this mapping unit has the profile described as typical for the series. The slope is dominantly about 3 percent.

Included with these soils in mapping are areas of Mansker, Berda, and Portales soils; areas of Potter soils that have slopes of more than 4 percent; and areas of bare, exposed caliche rock.

These soils are used mostly for range, but a few areas are mined for caliche. Capability unit VIIs-1, dryland; Very Shallow range site.

Potter and Berda soils, 8 to 15 percent slopes (PrE).—The soils in this undifferentiated group are in areas along and just below the edge of the High Plains. Many valleys and deep drainageways dissect these areas, which are characterized by small foot slopes below caprock escarpments. The slope is dominantly about 13 percent.

About 35 percent of this mapping unit is Potter soil, 25 percent is Berda soil, and 40 percent is other soils and land types. From one mapped area to another, however, the percentage of Potter and Berda soils varies. The Potter soil makes up 20 to 50 percent of the areas, and the Berda soil 10 to 40 percent. The Potter soil is on ridgetops and in strongly sloping areas, and the Berda soil is on foot slopes and benches below the Potter soil. Soil patterns are not uniform and occur without regularity.

The Potter soil has a surface layer of light-brown loam about 7 inches thick. The upper 5 inches of the underlying material is white, slightly platy caliche that is about 30 percent clay loam. Below this is white, platy caliche.

The Berda soil has a surface layer of grayish-brown, calcareous loam about 10 inches thick. The next layer is a pale-brown loam about 24 inches thick. The underlying material is light yellowish-brown, calcareous loam.

Included with these soils in mapping are areas of Gageby and Mansker soils, areas of Potter and Berda soils that have slopes of more than 15 percent, and areas of rock outcrops and escarpments.

This mapping unit is used for range and wildlife. Geological erosion is active. Potter soil is in capability unit VIIs-1, dryland, and Very Shallow range site. Berda soil is in capability unit VIe-2, dryland, and Hardland Slopes range site.

Pratt Series

The Pratt series consists of deep, rapidly permeable soils on uplands. These soils formed in sandy, eolian material.

These soils typically have a surface layer of grayish-brown and very pale brown, slightly acid fine sand about 25 inches thick. The next layer is reddish-yellow loamy sand, about 35 inches thick, that contains thin bands of yellowish-red sandy loam. The underlying material is yellow loamy sand.

Pratt soils are well drained and have low available water capacity.

Typical profile of Pratt fine sand, 1 to 4 percent slopes, 900 feet east of the Chicago, Rock Island, and Pacific Railroad overpass on U.S. Highway 66; the overpass is 6 miles west of the Oklahoma State line; then 0.4 mile south on an oilfield road, then 200 feet west into range:

A1—0 to 4 inches, grayish-brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; weak, fine, granular structure; soft; slightly acid; clear, smooth boundary.

A21—4 to 25 inches, very pale brown (10YR 8/4) fine sand, very pale brown (10YR 7/4) moist; weak, fine, granular structure; soft; slightly acid; gradual, wavy boundary.

A22&B2t—25 to 60 inches, reddish-yellow (7.5YR 6/6) loamy sand, reddish yellow (7.5YR 6/6) moist; Bt part yellowish-red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; A22 part has weak, fine, granular structure, Bt part has moderate, fine, subangular blocky structure; A22 part is loose, Bt part is hard, friable; the Bt part is made up of bands, ⅛ to 1 inch thick; total thickness of Bt part is about 7 inches; bands become thinner as depth increases; slightly acid to neutral; gradual, wavy boundary.

C—60 to 86 inches, yellow (10YR 8/6) loamy sand, yellow (10YR 7/6) moist; single grained; loose; few, thin (1/16 to ⅛ inch) bands of sandy loam; neutral.

The A1 horizon is pale brown, light brownish gray, very pale brown, grayish brown, or dark grayish brown. It ranges from 2 to 8 inches in thickness. The A21 horizon is pink, very pale brown, pale brown, or light brownish gray. It ranges from 18 to 30 inches in thickness. Depth to the A22&B2t horizon ranges from 21 to 38 inches. The A22&B2t horizon is brown, strong brown, light brown, yellowish red, reddish yellow, light reddish brown, or light yellowish brown. It ranges from 15 to 40 inches in thickness. The A22 part is loam, sand, loamy fine sand, or fine sand. The B2t part is made up of lenses or bands of fine sandy loam, sandy loam, or sandy clay loam. Each band is 1/16 to 1½ inches thick. Depth to the C horizon ranges from 36 to 60 inches. The C horizon is reddish yellow, yellow, yellowish brown, light yellowish brown, light brown, or reddish brown. It is fine sand or loamy sand.

The Pratt soils in this county are not within the range defined for the Pratt series, because they have a thicker A horizon of fine sand and their Bt horizon is made up of lamellae of sandy loam and thicker bands of sand. The composite texture is loamy sand. These differences, however, do not alter use and management of the soils.

Pratt fine sand, 1 to 4 percent slopes (PtB).—This soil is in convex areas on the landscape. It has the profile described as typical for the series. The surface is undulating and has a few duned areas. The slope is dominantly about 3 percent.

Included with this soil in mapping are areas of Delwin, Tivoli, and Devol soils.

Most of this soil is used for range, but a few areas are used for crops. The hazard of soil blowing is high. Capability unit VIe-1, dryland; Deep Sand range site.

Pullman Series

The Pullman series consists of deep, very slowly permeable soils on uplands. These soils formed in loamy, calcareous material.

These soils typically have a surface layer of dark grayish-brown silty clay loam about 7 inches thick. The next layer extends to a depth of 80 inches. The upper 19 inches of this layer is dark grayish-brown and dark-brown clay, the next 26 inches is brown clay, and the lower 28 inches is yellowish-red silty clay loam that is about 20 percent calcium carbonate in the lower part.

Pullman soils are well drained and have high available water capacity.

Typical profile of Pullman silty clay loam, 0 to 1 percent slopes, 500 feet east of the northwest corner of Wheeler County on Farm Road 1268, then 50 feet south in a cultivated field:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; hard, friable; mildly alkaline; abrupt, smooth boundary.

B21t—7 to 13 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, fine and medium, blocky structure; very hard, very firm; few fine pores; few thin clay films on ped faces; mildly alkaline; gradual, smooth boundary.

B22t—13 to 26 inches, dark-brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate, medium, blocky structure; very hard, very firm; few fine pores; common distinct clay films on ped faces; calcareous in lower 6 inches; moderately alkaline; diffuse, smooth boundary.

B23t—26 to 52 inches, brown (10YR 5/3) clay, brown (10YR 4/3) moist; weak, medium, blocky structure; very hard, very firm; common distinct clay films on ped faces; few, very fine, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B24t—52 to 60 inches, yellowish-red (5YR 5/6) silty clay loam, yellowish red (5YR 4/6) moist; moderate, medium, subangular blocky structure; very hard, firm; common distinct clay films on ped faces; few films, very fine soft masses, and concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

B25tca—60 to 80 inches, yellowish-red (5YR 5/6) silty clay loam, yellowish red (5YR 4/6) moist; weak, medium, subangular blocky structure; hard, friable; few thin clay films on ped faces; common, fine, soft masses and coatings of calcium carbonate; about 20 percent calcium carbonate; calcareous; moderately alkaline.

The A horizon is brown, dark brown, or dark grayish brown and ranges from 5 to 12 inches in thickness. A B1 horizon occurs in about 50 percent of the areas. The B21t and B22t horizons are brown, dark brown, or dark grayish brown. The B23t and B24t horizons are yellowish red, brown, or reddish brown. Depth to the Btca horizon ranges from 30 to 60 inches. The Btca horizon is reddish yellow, brown, yellowish red, or reddish brown. It is silty clay loam, clay loam, or clay. The content of calcium carbonate in the Btca horizon ranges from 20 to 40 percent.

Pullman silty clay loam, 0 to 1 percent slopes (PuA).—This soil is in plane areas. The slope is dominantly about 0.4 percent.

Included with this soil in mapping are areas of Abilene and Mansker soils.

This soil is used mostly for crops, and most of the cropland is irrigated. The hazard of soil blowing is slight. Capability unit IIIe-5, dryland; capability unit IIs-1, irrigated; Deep Hardland range site.

Quinlan Series

The Quinlan series consists of shallow, moderately rapidly permeable soils on uplands. These soils formed in weakly cemented, calcareous, loamy material.

These soils typically have a surface layer of light reddish-brown, calcareous silt loam about 8 inches thick. The next layer is a light reddish-brown silt loam 7 inches thick. The underlying material is light-red, weakly cemented sandstone of very fine sandy loam texture.

Quinlan soils are well drained and have low available water capacity.

In Wheeler County the Quinlan soils are mapped only in undifferentiated groups with Gypsum outcrop and Obaro soils.

Typical profile of Quinlan silt loam in an area of Obaro and Quinlan soils, rolling, 6.0 miles west and 2.7 miles south on Farm Road 2473 from its junction with U.S. Highway 83 in the south part of Wheeler, then 400 feet east in native range:

A1—0 to 8 inches, light reddish-brown (5YR 6/3) silt loam, reddish brown (5YR 5/3) moist; moderate, medium, granular structure; slightly hard, friable; common worm casts; common, very fine to medium fragments of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B2—8 to 15 inches, light reddish-brown (5YR 6/4) silt loam, reddish brown (5YR 5/4) moist; weak, fine and medium, subangular blocky structure; slightly hard, friable; many worm casts; few fragments of soft sandstone; common films, soft masses, coatings, and fine concretions of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

C—15 to 65 inches, light-red (2.5YR 6/6), weakly cemented sandstone of very fine sandy loam, red (2.5YR 4/6) moist; few roots penetrate to a depth of 20 inches; few very thin coatings and films of calcium carbonate in cracks in upper part; calcareous; moderately alkaline.

The A horizon is reddish brown, light reddish brown, red, reddish yellow, or yellowish red. It ranges from 4 to 11 inches in thickness. The A horizon and the B horizon are very fine sandy loam, loam, or silt loam. The B2 horizon is reddish brown, light reddish brown, yellowish red, reddish yellow, or red. Depth to the C horizon ranges from 10 to 20 inches. The C horizon is light red, light reddish brown, red, or reddish yellow. It is weakly cemented sandstone that is silt loam, loam, or very fine sandy loam in texture.

Rough Broken Land

Rough broken land (Ro) consists of gently sloping to steep areas in erosional uplands of the Permian red beds. These areas range from 10 to about 200 acres in size. They are cut by valleys and drainageways and characterized by ridges and bluffs of rocky material and by deep gullies. Active geological erosion has cut gullies in the soil material, which is highly erodible very fine sandy loam, silt loam, and silty clay loam. Slopes range from 6 to 60 percent but are dominantly about 25 percent. A few sheer drops of 5 to 50 feet are along escarpments.

Included with this land type in mapping are small areas of Clairemont, Cottonwood, Obaro, and Quinlan soils and Gypsum outcrop.

Most of this land type is in range. These areas are difficult to manage. This land type is also used as a refuge for various kinds of wildlife. Capability unit VIIs-2, dryland; Rough Breaks range site.

Sweetwater Series

The Sweetwater series consists of deep, moderately slowly permeable soils on bottom lands. These soils formed under wet conditions in calcareous loamy alluvium over sandy alluvium.

These soils typically have a surface layer of gray, calcareous silty clay loam and sandy clay loam that has yellowish-brown mottles in the lower part and is 20 inches thick. The underlying material is light brownish-gray, mottled loamy fine sand.

Sweetwater soils have moderate available water capacity and are poorly drained. A water table generally occurs within a depth of 3 feet of the surface.

Typical profile of Sweetwater silty clay loam in an area of Sweetwater soils, 6.5 miles north of the courthouse in Wheeler on U.S. Highway 83, then 1.7 miles east on a county road, then 300 feet south in range:

A11—0 to 8 inches, gray (10YR 5/1), stratified silty clay loam, very dark gray (10YR 3/1) moist; moderate, fine, subangular blocky structure parting to moderate, fine, granular; very hard, friable; many roots; calcareous; moderately alkaline; clear, wavy boundary.

A12g—8 to 20 inches, gray (10YR 5/1), stratified sandy clay loam, dark gray (10YR 4/1) moist; weak, fine, subangular blocky structure parting to weak, fine, granular; hard, friable; few, fine, distinct yellowish-brown mottles; calcareous; moderately alkaline; diffuse, wavy boundary.

IICg—20 to 60 inches, light brownish-gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable; common, coarse, faint, dark yellowish-brown mottles; calcareous; moderately alkaline.

The A11 horizon is gray, dark gray, or very dark gray and ranges from 8 to 20 inches in thickness. It is fine sandy loam, sandy clay loam, clay loam, or silty clay loam. The A11 horizon has faint to prominent, yellow to strong-brown mottles.

An A12 horizon occurs in about 84 percent of the areas. Where present, this horizon is gray, dark gray, very dark grayish brown, or light brownish gray. It is as much as 15 inches thick and is fine sandy loam, very fine sandy loam, sandy clay loam, clay loam, or silty clay loam. Mottles are faint to prominent.

Depth to the C horizon ranges from 16 to 30 inches. The C horizon is pale brown, strong brown, light brownish gray, grayish brown, gray, or light gray. It is sand, loamy sand, or loamy fine sand. In some areas it has thin strata of very fine sandy loam, fine sandy loam, or clay loam. Mottles are faint to distinct and are yellowish in color.

The Sweetwater soils in the county are not within the range defined for the Sweetwater series, because their A11 horizon is not so thick as is required for a mollic epipedon. This difference, however, does not alter the use and management of the soils.

Sweetwater soils (Sw).—These nearly level to gently sloping soils are in drainageways and on bottom lands. The areas generally are elongated up and down the drainageways and larger creeks. The surface is weakly undulating. The slope ranges from 0 to 5 percent but is dominantly 0.6 percent. These soils are in low-lying positions, and most areas are subject to occasional flooding mainly of short duration. Each flood leaves a thin layer of fresh soil material on the surface.

Included with these soils in mapping are areas of Lincoln, Guadalupe, and Gageby soils and stream channels. Also included are a few small areas of soils that have been drained and no longer have a high water table.

Soils in this mapping unit are used for range or for hay. Most areas are moist throughout and provide green forage all year. Scattered trees grow in many areas, and these areas and the surrounding upland areas are good habitat for most kinds of wildlife. Capability unit Vw-1, dryland; Loamy Bottomland range site.

Tipton Series

The Tipton series consists of deep, moderately permeable soils on uplands. These soils formed in loamy, calcareous material.

These soils typically have a surface layer of dark grayish-brown loam about 6 inches thick. The next layer extends to a depth of 75 inches. The upper 6 inches of this layer is dark grayish-brown clay loam, the next 33 inches is dark-brown and brown clay loam that contains films and threads of calcium carbonate in the lower part, and the lower 30 inches is light yellowish-brown and brown sandy clay loam.

Tipton soils are well drained and have high available water capacity.

Typical profile of Tipton loam, 0 to 1 percent slopes, 1.2 miles south of the Hemphill County line on U.S. Highway 83, then 0.9 mile west on a county road, then 0.3 mile south in a cultivated field:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; hard, friable; neutral; abrupt, smooth boundary.

B1—6 to 12 inches, dark grayish-brown (10YR 4/2) clay loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure parting to moderate, fine, subangular blocky; hard, friable; common worm casts; neutral; clear, smooth boundary.

B21t—12 to 24 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak, coarse, prismatic structure parting to moderate, fine, subangular blocky and blocky; very hard, firm; few thin clay films on ped faces; mildly alkaline; gradual, smooth boundary.

B22t—24 to 30 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate, fine, subangular blocky structure; very hard, firm; few thin clay films on ped faces; mildly alkaline; gradual, wavy boundary.

B23tca—30 to 45 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate, fine, subangular blocky structure; hard, friable; few thin clay films on ped faces; common threads, films, fine concretions and soft masses of visible calcium carbonate, about 5 percent of volume; calcareous; moderately alkaline; diffuse, wavy boundary.

B24t—45 to 52 inches, light yellowish-brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; moderate, fine, subangular blocky; hard, friable; few thin clay films on ped faces; few threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B3—52 to 75 inches, brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak, fine, subangular blocky structure; hard, friable; few, very fine, soft masses of calcium carbonate; calcareous; moderately alkaline.

The A horizon is dark brown, dark grayish brown, or very dark grayish brown and ranges from 6 to 12 inches in thickness. A B1 horizon that ranges from 4 to 10 inches in thickness occurs in about 50 percent of the areas. It is similar to the A horizon in color. The B21t horizon is brown, dark brown, or reddish brown and ranges from 8 to 18 inches in thickness. Structure of the B21t horizon ranges from weak to moderate, from fine to coarse, and from subangular blocky to prismatic. The B horizon becomes calcareous at a depth that ranges from 26 to 48 inches. The lower Bt horizon is brown, light yellowish brown, or light brownish gray. A horizon of calcium carbonate accumulation occurs in about 60 percent of the areas. In these areas the content of calcium carbonate ranges from common films and threads to 5 percent visible concretions, soft masses, and coatings. A B3 horizon occurs at a depth of more than 40 inches in about 55 percent of the areas. It is brown, reddish yellow, or reddish gray. There is a C horizon at a depth between 60 and 80 inches in about 25 percent of the areas, but it is at a greater depth in most areas. The B3 horizon and C horizon are loam or sandy clay loam. The C horizon is pinkish gray or reddish yellow.

Tipton loam, 0 to 1 percent slopes (TpA).—This soil occupies concave and plane areas that are oval in shape and average about 40 acres in size. The soil also is on terraces above creeks. It has the profile described as typical for the series. The slope is dominantly about 0.5 percent.

Included with this soil in mapping are areas of Abilene, Altus, Bippus, and Mansker soils and small areas of Tipton loam that has slopes of more than 1 percent.

Most of this soil is used for crops (fig. 14), but a few areas are in range. This soil is well suited to crops commonly grown in the county. The hazard of soil blowing is slight. Capability unit IIc-5, dryland; capability unit I-2, irrigated; Deep Hardland range site.

Tipton loam, 1 to 3 percent slopes (TpB).—This soil is in weakly convex to slightly concave areas that range from 30 to 100 acres in size and average about 50 acres. Most areas are elongated to oval in shape. The slope is dominantly about 1.7 percent.

This soil has a surface layer of dark-brown loam about 10 inches thick. The next layer in sequence from the top is 9 inches of very dark grayish-brown clay loam, 8 inches of dark-brown clay loam, 9 inches of brown clay loam that has thin clay films on ped faces, and 14 inches of light brownish-gray clay loam that contains films and threads of calcium carbonate. Below this it is brown clay loam.

Included with this soil in mapping are areas of Abilene, Bippus, and Mansker soils and small areas of nearly level Tipton loam.

This soil is used for crops and range. The hazards of soil blowing and water erosion are slight. Capability unit IIe-2, dryland; capability unit IIe-2, irrigated; Deep Hardland range site.

Tivoli Series

The Tivoli series consists of deep, rapidly permeable soils on uplands. These soils formed in eolian sand.

These soils typically have a surface layer of pale-brown fine sand about 8 inches thick. The underlying material extends to a depth of 60 inches and is reddish-yellow fine sand.

Figure 14.—**Cotton growing on a Tipton loam.**

Tivoli soils are excessively drained and have low available water capacity.

Typical profile of Tivoli fine sand, 1.0 mile northeast of Briscoe on Farm Road 1046, then 0.3 mile east on a county road, then 100 feet north in native range:

A1—0 to 8 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grained; loose; neutral; clear, wavy boundary.

C—8 to 60 inches, reddish-yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6) moist; single grained; loose; slightly acid.

The A horizon is pale brown or brown and ranges from 4 to 10 inches in thickness. The C horizon is reddish yellow, yellow, light yellowish brown, very pale brown, or strong brown. It ranges from slightly acid to mildly alkaline.

Tivoli fine sand (Tv).—This soil is in areas of dunes that range from 10 to 40 feet in height. These areas generally are irregular in shape but are elongated when they occur adjacent to creeks. The areas range from 30 to more than 1,000 acres in size. Slopes range from 3 to 30 percent but are dominantly about 8 percent.

Included with this soil in mapping are areas of Pratt, Devol, Likes, Grandfield, Hardeman, and Mobeetie soils.

This soil is used for range. It is not suitable for cultivation. Little runoff occurs, but the hazard of soil blowing is high. Capability unit VIIe-1, dryland; Deep Sand range site.

Veal Series

The Veal series consists of deep, moderately permeable soils on uplands. These soils formed in calcareous, loamy material.

These soils typically have a surface layer of yellowish-brown, calcareous fine sandy loam about 8 inches thick. The next layer in sequence from the top is 10 inches of light yellowish-brown fine sandy loam, 7 inches of very pale brown sandy clay loam that is about 40 percent calcium carbonate, and 45 inches of pinkish-white sandy clay loam that is about 30 percent calcium carbonate. The underlying material is reddish-yellow fine sandy loam.

Veal soils are well drained and have moderate available water capacity.

Typical profile of Veal fine sandy loam, 1 to 6 percent slopes (fig. 15), 2.3 miles east and southeast on a county road from the road intersection in Magic City, then 0.5 mile southeast on an oilfield road:

A1—0 to 8 inches, yellowish-brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak, medium, granular structure; slightly hard, very friable; few fine fragments of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B21—8 to 18 inches, light yellowish-brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak, medium, subangular blocky structure; slightly hard, friable; common threads and films,

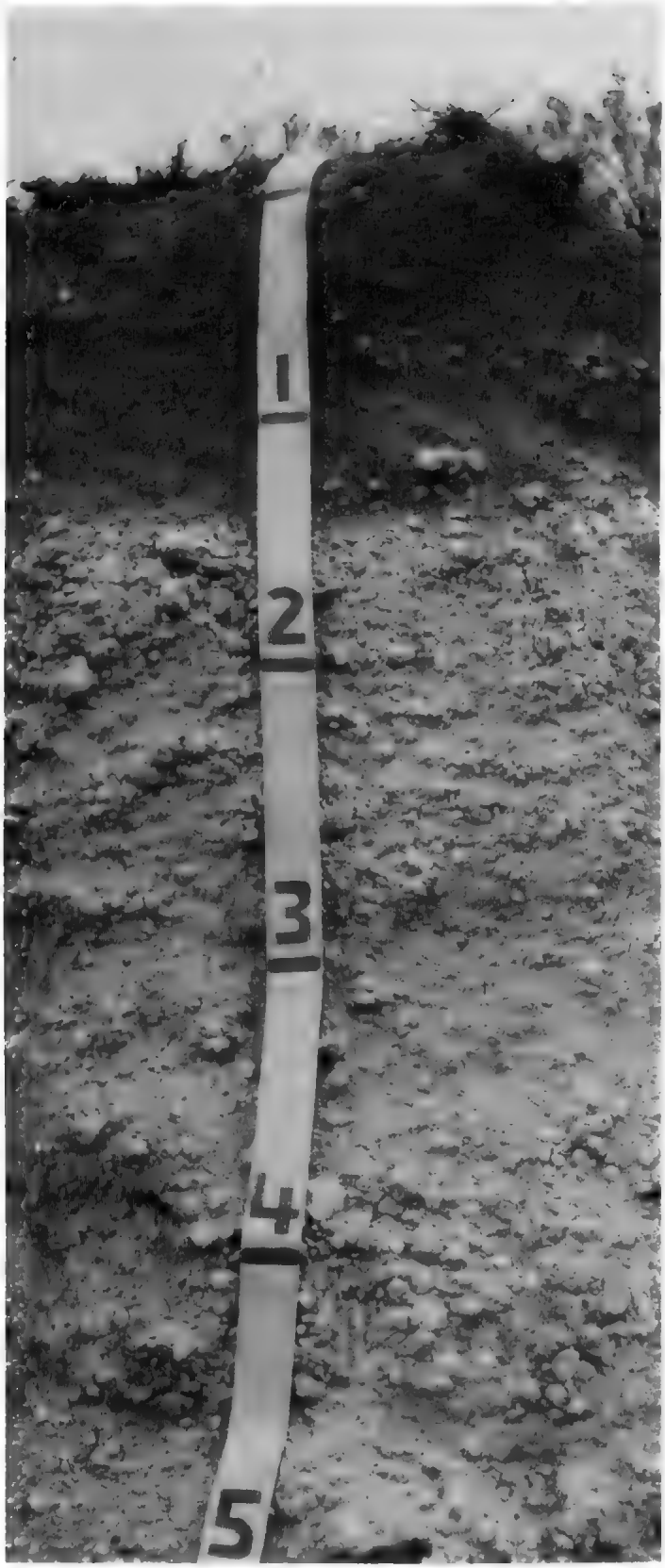

Figure 15.—**Profile of Veal fine sandy loam showing accumulation of calcium carbonate.**

fine concretions, and soft masses of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B22ca—18 to 25 inches, very pale brown (10YR 8/4) sandy clay loam, very pale brown (10YR 7/4) moist; moderate, medium, subangular blocky structure; hard, friable; about 40 percent of volume is very fine to medium concretions, soft masses, and coatings of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

B3ca—25 to 70 inches, pinkish-white (7.5YR 8/2) sandy clay loam, pinkish gray (7.5YR 6/2) moist; weak, medium, subangular blocky structure; hard, friable; about 30 percent of volume is very fine to medium concretions, soft masses, and coatings of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

C—70 to 80 inches, reddish-yellow (7.5YR 6/8) fine sandy loam, strong brown (7.5YR 5/8) moist; massive; slightly hard, very friable; common, faint, medium, yellow mottles; few fine concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

The A horizon is yellowish brown, grayish brown, or brown and ranges from 5 to 10 inches in thickness. The B21 horizon is brown, light yellowish brown, pale brown, or grayish brown. It ranges from 5 to 13 inches in thickness and is loam, fine sandy loam, or sandy clay loam. Depth to the B22ca horizon ranges from 10 to 23 inches. It is very pale brown, pale brown, pink, or light brown. It ranges from 6 to 30 inches in thickness and is sandy clay loam or clay loam. The content of visible carbonates ranges from about 40 percent to 50 percent by volume. The B3ca horizon is pinkish white, light brown, pale brown, or reddish yellow. A B3ca horizon occurs in about 50 percent of the areas. It ranges from 6 to 50 inches in thickness and from fine sandy loam to sandy clay loam. Depth to the C horizon ranges from 40 to more than 60 inches. The C horizon is reddish yellow, yellow, reddish brown, light brown, very pale brown, pink, or pinkish gray. It is loamy fine sand, sandy clay loam, or fine sandy loam.

Veal fine sandy loam, 1 to 6 percent slopes (VeC).—This soil is on hillsides and low ridges. The areas are convex or are elongated along ridges. The slope is dominantly about 2.5 percent.

Included with this soil in mapping are areas of Mobeetie, Potter, Grandfield, and Mansker soils. Also included are soils that are similar to this Veal soil but have slopes of as much as 8 percent.

This soil is used for crops and range. The high lime content causes yellowing, or chlorosis, of some crops. The hazards of soil blowing and water erosion are moderate. Capability unit IVe-5, dryland; capability unit IVe-1, irrigated; Mixedland Slopes range site.

Use and Management of the Soils

This section has several parts. The first explains the system of capability groupings used by the Soil Conservation Service and describes the management of the soils in Wheeler County by capability units, both dryland and irrigated. The second part lists predicted yields of the principal crops. Next, management of the soils for the range and use of the soils for wildlife are described. Finally, the properties and features that affect engineering practices are listed, mainly in tables.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The

soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in Wheeler County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIc-4 or IIIe-3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Wheeler County are described and suggestions for the use and management of the soils are given.

Management by capability units, dryland [2]

In the following pages, the capability units for dryfarmed soils in Wheeler County are described and suggestions for use and management are discussed. To find the capability classification for any given mapping unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT IIc-1, DRYLAND

This unit consists of deep, nearly level to gently sloping soils that have a surface layer of clay loam. Permeability is moderate. Available water capacity is high. If these soils are left unprotected, a crust forms on the surface after heavy rain. The hazard of soil blowing is slight.

Grain sorghum, cotton, and wheat are the main crops. Some forage sorghum and alfalfa are also grown.

Management is needed that maintains and improves soil condition and controls erosion. Wheat, grain sorghum, alfalfa, and tame pasture in the cropping system are well suited to these soils. Residue management is effective in the control of soil blowing. Tillage that roughens the soil surface can be used to supplement inadequate crop residues.

CAPABILITY UNIT IIc-2, DRYLAND

This unit consists of deep, nearly level soils. Permeability is moderate or moderately slow. Available water capacity is high. The hazard of soil blowing is slight.

Grain sorghum and wheat are the main crops. Some forage sorghum and cotton are grown.

Management is needed that maintains and improves soil condition and controls erosion. A cropping system that includes sorghums, wheat, or tame pasture helps

[2] By ALLEN H. KING, conservation agronomist, Soil Conservation Service, Amarillo, Texas.

to maintain soil condition. Management of sorghum and wheat residues helps control soil blowing, but emergency tillage that roughens the soil surface is needed if residues are inadequate to control soil blowing.

CAPABILITY UNIT IIc-3, DRYLAND

The only soil in this unit is Clairemont silt loam. This is a deep, nearly level soil. Permeability is moderate. Available water capacity is high. This soil is flooded occasionally. The hazard of soil blowing is slight.

Grain sorghum, wheat, and cotton are the main crops. Some alfalfa, forage sorghum, and tame pasture are also grown.

Management is needed that maintains and improves the soil condition and controls erosion. A cropping system that includes sorghums, wheat, alfalfa, or tame pasture helps to maintain soil condition. Wheat and sorghum residues help to control soil blowing, but tillage that roughens the soil surface is needed if residues are inadequate to protect the soil from blowing.

CAPABILITY UNIT IIc-4, DRYLAND

The only soil in this unit is Abilene clay loam, 0 to 1 percent slopes. This is a deep, nearly level soil. Permeability is moderately slow. Available water capacity is high. If the clay loam surface layer is not protected, it tends to crust after heavy rain. The hazard of soil blowing is slight.

Grain sorghum and wheat are the main crops. Some forage sorghum and cotton are also grown.

Management is needed that maintains and improves the soil condition, controls erosion, and conserves moisture. A cropping system that includes sorghums and wheat and carefully managed residues is effective, but emergency tillage that roughens the soil surface can be used if residues are inadequate to control soil blowing.

CAPABILITY UNIT IIc-5, DRYLAND

The only soil in this unit is Tipton loam, 0 to 1 percent slopes. This is a deep, nearly level soil. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight.

Grain sorghum, cotton, and wheat are the main crops. Some alfalfa and forage sorghum are also grown.

Management is needed that maintains and improves the soil condition and controls erosion. A carefully managed cropping system that includes wheat, sorghums, or alfalfa helps to control erosion and maintain soil condition. Emergency tillage that roughens the soil surface is needed if crop residues are inadequate to protect the soil from blowing.

CAPABILITY UNIT IIe-1, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderate or moderately slow. Available water capacity is high. The hazards of soil blowing and water erosion are slight.

Grain sorghum, cotton, and wheat are the main crops. Small acreages of tame pasture and forage sorghum are also grown.

Management is needed that maintains and improves the soil condition and controls erosion. Soil condition is maintained and soil blowing and runoff are minimized if wheat and sorghum residues are properly managed. Emergency tillage that roughens the soil surface is needed where residues are inadequate to control soil blowing. Terraces, contour farming, and grassed waterways, if needed, are used to control water erosion.

CAPABILITY UNIT IIe-2, DRYLAND

The only soil in this unit is Tipton loam, 1 to 3 percent slopes. This is a deep, gently sloping soil. Permeability is moderate. Available water capacity is high. The hazards of soil blowing and water erosion are slight.

Grain sorghum, cotton, and wheat are the main crops. Some forage sorghum, alfalfa, and tame pasture are also grown.

Management is needed that maintains and improves the soil condition, controls erosion, and conserves moisture. A cropping system that includes wheat and sorghums is effective in improving soil condition, controlling soil blowing, and reducing runoff. Tillage that roughens the soil surface is needed if crop residue is inadequate to control soil blowing. Terraces and contour farming are needed to control water erosion. Diversion terraces and grassed waterways are used to provide safe outlets for excess water.

CAPABILITY UNIT IIe-3, DRYLAND

This unit consists of deep, nearly level to gently sloping soils. Permeability is moderate or moderately rapid. Available water capacity is moderate to high. The hazard of soil blowing is moderate.

Grain sorghum, cotton, and wheat are the main crops. Some alfalfa, forage sorghum, and tame pasture are also grown.

Management is needed that maintains or improves soil condition and controls erosion. Soil condition can be maintained if the cropping system includes alfalfa, sorghums, wheat, or tame pasture. Carefully managed sorghum and wheat residues help to control soil blowing, but tillage that roughens the soil surface is needed if residues are inadequate.

CAPABILITY UNIT IIIe-1, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high. The hazards of soil blowing and water erosion are slight.

Grain sorghum and wheat are the main crops. Small acreages of forage sorghum and cotton are also grown.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Sorghum and wheat residues are effective, but emergency tillage that roughens the soil surface is needed if residues are inadequate to protect the soils from blowing. Terraces, contour farming, and grassed waterways are used to control water erosion and to reduce runoff.

CAPABILITY UNIT IIIe-2, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderately slow or moderate. Available water capacity is high. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. If the surface is not protected, it crusts after heavy rain.

Grain sorghum, cotton, and wheat are the main crops. A small acreage of forage sorghum is also grown.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Soil condition is maintained and soil blowing is minimized if crop residues are properly managed, but emergency tillage that roughens the soil surface is needed where crop residues are inadequate to control soil blowing. Terraces, contour farming, and diversions and grassed waterways, if needed, are used to control water erosion.

CAPABILITY UNIT IIIe-3, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight, and the hazard of water erosion is moderate.

Grain sorghum, cotton, and wheat are the main crops. A small acreage of forage sorghum is also grown.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Soil condition is maintained, soil blowing is minimized, and runoff from rain is slowed down if sorghum and wheat residues are properly managed. Emergency tillage that roughens the soil surface is needed where crop residues are inadequate to control soil blowing. Terraces, contour farming, and diversions and grassed waterways, if needed, are used to control water erosion.

CAPABILITY UNIT IIIe-4, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is moderate, and the hazard of water erosion is slight to moderate.

Wheat, grain sorghum, and cotton are the main crops. Small acreages of alfalfa and forage sorghums are also grown.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Careful management of sorghum and wheat residues is effective, but emergency tillage that roughens the soil surface is needed if crop residues are inadequate to control soil blowing. Contour farming and terracing are used to control water erosion and to reduce runoff. Grassed waterways are needed in some areas for terrace outlets.

CAPABILITY UNIT IIIe-5, DRYLAND

The only soil in this unit is Pullman silty clay loam, 0 to 1 percent slopes. This is a deep, nearly level soil. Permeability is very slow. Available water capacity is high. The hazard of soil blowing is slight. If the surface is not protected, it crusts after heavy rain.

Grain sorghum and wheat are the main crops. Some forage sorghum and cotton are also grown.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Sorghum and wheat residues are effective, but emergency tillage that roughens the soil surface is needed if crop residues are inadequate to control soil blowing.

CAPABILITY UNIT IVe-1, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderate or moderately slow. Available water capacity is high. The hazard of soil blowing is slight, and the hazard of water erosion is moderate. If the surface is not protected, it crusts after heavy rain.

Grain sorghum, forage sorghum, and wheat are the main crops.

Managment is needed that maintains soil condition, conserves moisture, and controls erosion. Soil condition is maintained and erosion is minimized if crop residues are properly managed, but emergency tillage that roughens the soil surface is needed where residues are inadequate to control soil blowing. Terraces and contour farming are needed to control water erosion and to reduce runoff. Grassed waterways and diversions, if needed, are useful to carry off excess runoff.

CAPABILITY UNIT IVe-2, DRYLAND

This unit consists of deep to moderately deep, gently sloping soils. Permeability is moderate. Available water capacity is high to moderate. The hazard of soil blowing is slight, and the hazard of water erosion is moderate.

The main crops are grain sorghum, wheat, and forage sorghum.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Sorghums and wheat are needed continuously in the cropping system to provide growing cover and crop residues that control soil blowing and water erosion. Emergency tillage that roughens the soil surface can be used to supplement inadequate crop residues. Contour farming and terracing are needed to reduce runoff and to control water erosion. Grassed waterways and diversions are needed in some places to provide outlets for runoff from terraces or other sources.

CAPABILITY UNIT IVe-3, DRYLAND

The only soil in this unit is Grandfield fine sandy loam, 3 to 5 percent slopes, eroded. This is a deep, gently sloping soil. Permeability is moderate. Available water capacity is high. The hazards of soil blowing and water erosion are moderate.

Grain sorghum, cotton, wheat, and forage sorghum are the main crops.

Management is needed that maintains soil condition, controls erosion, and conserves moisture. Wheat and sorghums are needed continuously in the cropping system to provide growing cover and crop residues that control soil blowing and water erosion. Emergency tillage that roughens the soil surface can be used to supplement inadequate crop residues. Wind stripcropping can be used if cotton is grown. Contour farming and terracing are also needed to reduce water runoff and to control erosion. Grassed waterways and diversions are needed in some places to provide outlets for runoff.

CAPABILITY UNIT IVe-4, DRYLAND

This unit consists of deep, gently sloping soils. Permeability is moderately rapid. Available water capacity is moderate. The hazards of water erosion and soil blowing are moderate.

Grain sorghum, cotton, wheat, and some forage sorghum are grown.

Management is needed that maintains soil condition, conserves moisture, and controls erosion. Wheat and sorghums or similar crops are needed continuously in the cropping system to provide growing cover and crop

residues that control soil blowing and water erosion. Emergency tillage that roughens the soil surface can be used to supplement inadequate crop residues. Contour farming and terraces are needed to reduce runoff and to control erosion. Grassed waterways and diversion terraces are needed in some places to provide outlets for runoff.

CAPABILITY UNIT IVe-5, DRYLAND

The only soil in this unit is Veal fine sandy loam, 1 to 6 percent slopes. This is a deep, gently sloping to sloping soil. Permeability and available water capacity are moderate. The hazards of soil blowing and water erosion are moderate.

Grain sorghum, forage sorghum, and wheat are the main crops.

Management is needed that maintains soil condition, conserves water, and controls erosion. Grain sorghum, wheat, and forage sorghum or similar crops are needed in the cropping system. Properly managed residues of these crops maintain soil condition and minimize erosion. Emergency tillage that roughens the soil surface can be used to supplement inadequate crop residues. Contour farming and terracing are also needed to reduce water erosion and to slow runoff.

CAPABILITY UNIT IVe-6, DRYLAND

This unit consists of deep, nearly level and gently sloping soils. Permeability is moderate. The available water capacity is moderate. The hazard of soil blowing is high, and the hazard of water erosion is slight.

Grain sorghum, cotton, and wheat are the main crops. Forage sorghum and alfalfa also are grown.

Management is needed that maintains soil condition and controls erosion. A cropping system that includes properly fertilized grain sorghum, wheat, and forage sorghum and careful management of crop residues are effective. Emergency tillage that roughens the soil surface is needed if crop residues are inadequate to control soil blowing. Deep plowing that brings up some of the finer textured subsoil, and thereby increases the content of clay in the surface layer, is useful in helping to check soil blowing. In these deep-plowed areas, terraces and grassed waterways are needed for controlling water erosion.

CAPABILITY UNIT IVe-7, DRYLAND

The only soil in this unit is Devol loamy fine sand, 0 to 3 percent slopes. This is a deep, nearly level to gently sloping soil. Permeability is moderately rapid. Available water capacity is low. The hazard of soil blowing is high.

Grain sorghum, forage sorghum, and small grains are the main crops.

Management is needed that maintains soil condition and controls erosion. Such crops as sorghum and small grain are needed continuously in the cropping system to provide growing cover and crop residues that control water erosion and soil blowing. Fertilization and adequate residues are needed to maintain soil condition. Emergency tillage that roughens the soil surface can be used to supplement inadequate crop residues.

CAPABILITY UNIT Vw-1, DRYLAND

Only Sweetwater soils are in this unit. These are deep soils on bottom lands. Permeability is moderately slow. Available water capacity is moderate. The soils are subject to occasional flooding. A water table is at a depth of about 30 inches during most of the year.

These soils are used for range and hay.

Fertilizers and grazing management of native grasses are needed to make good use of these soils.

CAPABILITY UNIT Vw-2, DRYLAND

This unit consists of deep, nearly level to gently sloping Lincoln soils. These soils are on bottom lands that are subject to occasional flooding. Permeability is rapid. Available water capacity is low. The hazard of soil blowing is high.

Most areas of these soils are used as range. In a few areas, bermudagrass and weeping lovegrass are grown for hay and pasture.

Grazing management, fertilization of hayland and pasture, and brush control are needed to make good use of these soils.

CAPABILITY UNIT VIe-1, DRYLAND

The only soil in this unit is Pratt fine sand, 1 to 4 percent slopes. This is a deep, gently sloping soil. Permeability is rapid. Available water capacity is low. The hazard of soil blowing is high.

This soil is well suited to its main use, native rangeland.

Management is needed that maintains or improves the stand and vigor of adapted grasses and forbs, protects the surface from soil blowing, and provides quality forage for livestock and wildlife. Grazing management and, if needed, control of existing brush are effective. Consideration of wildlife is needed in any brush-control program.

CAPABILITY UNIT VIe-2, DRYLAND

This unit consists of deep, sloping to moderately steep and rolling soils. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight, and water erosion is also a hazard if the soil surface is exposed.

These soils are better suited to range, wildlife, and recreation than to most other uses.

Grazing management is needed that maintains or improves the stand and vigor of adapted forbs and grasses, protects the soil from erosion, increases the amount of water that soaks into the ground, and provides quality forage for livestock and wildlife.

CAPABILITY UNIT VIe-3, DRYLAND

The soils of this unit are deep and gently sloping to sloping and rolling. Permeability is moderately rapid. Available water capacity is moderate. The hazard of soil blowing is moderate, and the hazard of water erosion is high.

These soils are better suited to other uses than to crops. Range is the main use.

Management is needed that maintains or improves the stand and vigor of adapted forbs and grasses, protects the surface from erosion, increases the amount of water

that soaks into the ground, and provides quality forage for livestock and wildlife. Grazing management, and, if needed, brush control are effective. Consideration of wildlife is needed in any brush-control program.

CAPABILITY UNIT VIe-4, DRYLAND

This unit is made up of deep to shallow, gently sloping and rolling soils. Permeability is moderate to moderately rapid. Available water capacity is low to high. The hazard of soil blowing is slight. The hazard of water erosion is slight to high.

These soils are better suited to other uses than to crops. Range is the main use.

Proper management of grazing maintains or improves the stand and vigor of adapted forbs and grasses, protects the surface from erosion, increases the amount of water that soaks into the ground, and provides quality forage for livestock and wildlife.

CAPABILITY UNIT VIe-5, DRYLAND

The only soil in this unit is Hardeman fine sandy loam, 5 to 8 percent slopes. This is a deep, sloping soil. Permeability is moderately rapid. Available water capacity is moderate. The hazard of soil blowing is moderate, and the hazard of water erosion is high.

This soil is better suited to other uses than to crops. Most of the acreage is used for range.

Management is needed that maintains or improves the stand and vigor of adapted grasses and forbs, protects the surface from erosion, increases the amount of water that soaks into the ground, and provides quality forage for livestock and wildlife. Grazing management and, if needed, brush control are effective. Consideration of wildlife is needed in any brush-control program.

CAPABILITY UNIT VIe-6, DRYLAND

This unit consists of deep, undulating and gently sloping to sloping soils. Permeability is moderate or moderately rapid. Available water capacity is low to high. The hazard of soil blowing is high, and the hazard of water erosion is moderate to high. Some areas of these soils are eroded.

These soils are better suited to other uses than to crops. Range is the main use.

Management is needed that maintains or improves the stand and vigor of adapted grasses and forbs, protects the surface from soil blowing, and provides quality forage for livestock and wildlife. Grazing management and, if needed, brush control are effective. Consideration of wildlife is needed in any brush-control program.

CAPABILITY UNIT VIIe-1, DRYLAND

This unit consists of deep, duned, gently sloping to steep soils and land types. Permeability is rapid. Available water capacity is low. The hazard of soil blowing is high. Some areas are eroded.

The soils in this unit are better suited to range and wildlife than to other uses, and range is the main use.

Management is needed that maintains or improves the stand and vigor of adapted forbs and grasses, protects the surface from soil blowing, and provides quality forage for livestock and wildlife. Grazing management and, if needed, brush control are effective. Consideration of wildlife is needed in any brush-control program.

CAPABILITY UNIT VIIs-1, DRYLAND

This unit consists of very shallow to shallow, gently sloping to moderately steep, and undulating to rolling soils and land types. Available water capacity is low. The hazard of water erosion is high.

The use of these soils is limited to range, wildlife, and recreation. Most areas are used for range.

Management is needed that maintains or improves the stand and vigor of adapted forbs and grasses, controls erosion, increases the amount of water that soaks into the ground, and provides quality forage for livestock and wildlife. Grazing management and, if needed, brush control are effective. Consideration of wildlife is needed in any brush-control program.

CAPABILITY UNIT VIIs-2, DRYLAND

Rough broken land is the only mapping unit in this capability unit. It is sloping to very steep and is on erosional uplands. It occurs along escarpments, ridges, and bluffs and in areas cut by valleys and drainageways. Geological erosion is active.

Limited grazing, wildlife, and recreation are the main uses.

Management of grazing and careful location of fences, roads, and water facilities are needed to slow erosion and maintain and improve the stand and vigor of existing grasses. Areas of gravel and caliche pits need to be smoothed to uniform slopes to allow revegetation.

Management by capability units, irrigated

In the following pages, the capability units for irrigated soils in Wheeler County are described and suggestions for use and management are discussed. To find the capability classification for any given mapping unit refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1, IRRIGATED

The soils in this unit are deep, nearly level silt loams and clay loams. Permeability is moderately slow. Available water capacity is high.

Cotton, grain sorghum, small grain, and forage sorghum are common crops.

Management is needed that maintains and improves the soil condition and uses water timely and efficiently. Soil condition can be maintained if the cropping system includes sorghums and small grains, if crop residues are managed, and if fertilizer is used judiciously. A proper irrigation system is needed that supplies water without waste.

CAPABILITY UNIT I-2, IRRIGATED

The soils in this unit are deep, nearly level to gently sloping loams and clay loams. Permeability is moderate. Available water capacity is high.

Cotton, grain sorghum, small grain, alfalfa, and forage sorghum are common crops.

Management is needed that maintains and improves soil condition and uses water timely and efficiently. Soil condition can be maintained if the cropping system includes fertilized sorghums and small grains, and if crop residues are managed. A designed irrigation system is needed that applies water without waste.

CAPABILITY UNIT I-3, IRRIGATED

The soils in this unit are deep, nearly level to gently sloping fine sandy loams and silt loams. Permeability is moderate or moderately rapid. Available water capacity is moderate to high.

Sorghum, cotton, small grain, and alfalfa are common crops.

Management is needed that maintains the soil condition and uses water timely and efficiently. Soil condition can be maintained if the cropping system includes sorghums, small grains, or alfalfa, if crop residues are managed, and if fertilizers are used. A proper irrigation system is needed that applies water without waste.

CAPABILITY UNIT IIe-1, IRRIGATED

The only soil in this unit is Abilene clay loam, 1 to 3 percent slopes. This is a deep, gently sloping soil. Permeability is moderately slow. Available water capacity is high. The hazard of water erosion is moderate.

Sorghums and cotton are the main crops.

Management is needed that maintains and improves soil condition, controls erosion, and uses water timely and efficiently. Soil condition can be maintained if the cropping system includes properly fertilized sorghums or small grains. An irrigation system is needed that supplies water to crops without waste or soil erosion.

CAPABILITY UNIT IIe-2, IRRIGATED

The soils in this unit are deep, gently sloping loams, silt loams, and clay loams. Permeability is moderate. Available water capacity is high. The hazard of water erosion is slight to moderate.

Cotton, grain sorghum, small grain, forage sorghum, and alfalfa are common crops.

Management is needed that maintains and improves the soil condition, controls erosion, and uses water timely and efficiently. Soil condition can be improved or maintained if the cropping system includes properly fertilized sorghums, small grains, or alfalfa and if crop residues are managed. A designed irrigation system is needed that supplies water to crops without waste or soil erosion.

CAPABILITY UNIT IIe-3, IRRIGATED

The only soil in this unit is Grandfield fine sandy loam, 1 to 3 percent slopes. This is a deep, gently sloping soil. Permeability is moderate. Available water capacity is high. The hazard of water erosion is slight, and the hazard of soil blowing is moderate.

Cotton, sorghum, small grain, and alfalfa are common crops.

Management is needed that maintains and improves soil condition, controls erosion, and uses water timely and efficiently. This type of management includes the rotation of crops, the use of fertilizer, the careful management of irrigation water in a designed irrigation system, and the return of crop residues to the soil.

CAPABILITY UNIT IIe-4, IRRIGATED

The soils in this unit are deep, nearly level fine sandy loams. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight to moderate, and the hazard of water erosion is slight.

Cotton, sorghum, small grain, and alfalfa are common crops.

Management is needed that maintains or improves soil condition, controls erosion, and uses water timely and efficiently. This type of management includes fertilization, crop rotation, timely tillage, residue management, and use of a designed irrigation system.

CAPABILITY UNIT IIs-1, IRRIGATED

The only soil in this unit is Pullman silty clay loam, 0 to 1 percent slopes. This is a nearly level, deep soil. Permeability is very slow. Available water capacity is high.

Small grain, sorghum, and cotton are common crops.

Management is needed that maintains or improves soil condition and uses water timely and efficiently.

CAPABILITY UNIT IIIe-1, IRRIGATED

The soils in this unit are deep, gently sloping loams and silt loams. Permeability is moderate. Available water capacity is high. The hazard of soil blowing is slight, and the hazard of water erosion is slight to moderate.

Small grain and sorghum are the main crops. Some alfalfa is also grown.

Management is needed that maintains and improves soil condition, uses water timely and efficiently, and controls erosion. Crop rotation, fertilization, and use of crop residues help to control erosion and to improve soil condition. Irrigation water should be applied in a designed irrigation system. Grassed waterways and diversion terraces are needed in some areas to control excess runoff.

CAPABILITY UNIT IIIe-2, IRRIGATED

The soils in this unit are deep, nearly level to gently sloping fine sands and loamy fine sands. Permeability is moderate. The hazard of soil blowing is high. The hazard of water erosion is slight.

Sorghum, cotton, small grain, and alfalfa are the main crops.

Management is needed that maintains or improves the soil condition, controls erosion, and uses water timely and efficiently. Crops grown in a rotation and fertilized help control soil blowing and maintain soil condition. Water should be evenly distributed by a sprinkler irrigation system.

CAPABILITY UNIT IIIe-3, IRRIGATED

The only soil in this unit is Grandfield fine sandy loam, 3 to 5 percent slopes. This is a deep, gently sloping soil. Permeability is moderate. Available water capacity is high. The hazards of water erosion and soil blowing are moderate.

Sorghum and small grain are the main crops.

Management is needed that maintains or improves the soil condition, controls erosion, and uses water timely and efficiently. Using crop residues from a cropping system that includes properly fertilized small grain and sorghum can help maintain the condition of the soil and control erosion. Irrigation water needs to be applied by a designed irrigation system. Diversion terraces and grassed waterways are needed in some areas to control excess water and runoff.

CAPABILITY UNIT IIIe-4, IRRIGATED

The soils in this unit are deep, gently sloping silt loams. Permeability is moderate. Available water capacity is high. The hazard of water erosion is moderate, and the hazard of soil blowing is slight.

Grain sorghum, forage sorghum, and wheat are the main crops.

Management is needed that maintains or improves the soil condition, controls erosion, and uses water timely and efficiently. Small grains and sorghums produce protective crop residues. Soil condition can be maintained if the cropping system includes these crops, and if these crops are properly fertilized. Irrigation water needs to be applied by a designed irrigation system. Diversion terraces and grassed waterways can be used in areas of excess runoff.

CAPABILITY UNIT IIIe-5, IRRIGATED

The only soil in this unit is Hardeman fine sandy loam, 3 to 5 percent slopes. This is a deep, gently sloping soil. Permeability is moderately rapid. Available water capacity is moderate. The hazards of soil blowing and water erosion are moderate.

Wheat, grain sorghum, and forage sorghum are the main crops.

Management is needed that maintains or improves the soil condition, controls erosion, and uses water timely and efficiently. The soil condition can be improved and erosion can be controlled by using crop residues from a cropping system that includes properly fertilized small grains and sorghums. Irrigation water needs to be applied by a designed system. Diversion terraces and grassed waterways are necessary in some areas to control runoff.

CAPABILITY UNIT IVe-1, IRRIGATED

The soils in this unit are deep, gently sloping fine sandy loams, loams, and clay loams. Permeability is moderate. Available water capacity is high to moderate. The hazard of water erosion is moderate. The hazard of soil blowing is slight to moderate.

Small grain, sorghum, and legumes are the main crops.

Management is needed that maintains and improves soil condition, uses water efficiently and timely, and controls erosion. Crops such as wheat and grain sorghum maintain soil condition if they are grown in rotation, fertilized, and managed for erosion control. A designed irrigation system is needed. Diversion terraces and grassed waterways are needed in some areas to carry off excess water.

CAPABILITY UNIT IVe-2, IRRIGATED

The soils in this unit are deep, gently sloping to sloping loamy fine sands. Permeability is moderate. Available water capacity is moderate to high. The hazard of soil blowing is high, and the hazard of water erosion is moderate.

The main crops are forage sorghum, grain sorghum, and small grain. Some pasture grasses also are grown.

Management is needed that controls erosion, maintains and improves the soil condition, and uses water timely and efficiently. Small grain and sorghum should be closely planted or drilled and fertilized. The residues from these crops need to be kept on the surface to help control erosion and to maintain the soil condition. Irrigation water should be applied by a sprinkler system.

CAPABILITY UNIT IVe-3, IRRIGATED

The soils in this unit are deep and nearly level to sloping. Permeability is moderately rapid. Available water capacity is low. The hazard of soil blowing is moderate to high.

Small grain, sorghum, and alfalfa are the main crops.

Management is needed that controls erosion, maintains the soil condition, and uses water timely and efficiently. Crops should be closely spaced or drilled and fertilized. The residues from these crops should be managed to prevent soil blowing. A sprinkler irrigation system should be used.

Predicted Yields

Predicted yields are given in table 2 for the arable soils in Wheeler County. The predicted yields are provided for a high level of management only. This management level represents the better practices for managing soils, plants, and water. Listed below are the main practices that contribute to high yields.

A high level of management for dryfarmed crops includes the following practices:

1. Precipitation is conserved.
2. Close-growing and soil-protecting crops are alternated with clean-tilled crops and other crops that do not help protect the soil from erosion.
3. Residue from crops is kept on the soil surface at least during critical erosion periods.
4. Soil tillage is timely and held to a minimum.
5. Terraces, diversions, and grassed waterways are used if needed, and contour farming follows terraces and guidelines.

A high level of management for irrigated crops includes the following practices:

1. Precipitation is conserved.
2. Crops that protect and improve the soil are alternated with clean-tilled and erosion-permitting crops.
3. Fertilizers are used to meet crop needs.
4. Residue from crops remain on or near the surface during critical erosion periods.
5. Soil tillage is timely and held to a minimum.
6. An irrigation system is installed to utilize irrigation water efficiently without waste or erosion.
7. Irrigation water is applied in accordance with soil characteristics and crop-growth requirements.

The irrigated acreage in the county is small, and reliable data are not available for all irrigated mapping units.

TABLE 2.—*Predicted average acre yields of principal crops on dryland and irrigated soils*

[Only the arable soils are listed. Dashes indicate that crop generally is not grown on the soil named]

Soil	Dryland			Irrigated			
	Cotton (lint)	Grain sorghum	Wheat	Cotton (lint)	Grain sorghum	Wheat	Alfalfa (hay)
	Lb.	*Lb.*	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Tons*
Abilene clay loam, 0 to 1 percent slopes	300	2,000	25	850	6,500	60	—
Abilene clay loam, 1 to 3 percent slopes	250	1,500	20	800	6,000	55	—
Abilene clay loam, 3 to 5 percent slopes	150	1,000	10	—	—	—	—
Altus fine sandy loam	300	2,500	20	850	6,500	50	6.0
Berda loam, dark surface variant, 3 to 5 percent slopes	—	750	10	—	—	—	—
Bippus clay loam, 0 to 1 percent slopes	250	1,250	15	850	6,000	60	6.0
Bippus clay loam, 1 to 3 percent slopes	225	1,250	15	800	5,500	55	5.5
Bippus clay loam, 3 to 5 percent slopes	175	1,000	10	—	—	—	—
Carey silt loam, 0 to 1 percent slopes	250	1,500	20	850	6,500	60	6.0
Carey silt loam, 1 to 3 percent slopes	200	1,500	20	800	6,000	55	5.5
Clairemont silt loam	350	2,500	25	—	—	—	6.0
Cobb loamy fine sand, loamy substratum, 1 to 3 percent slopes	200	1,250	15	—	—	—	—
Delwin fine sand, 0 to 3 percent slopes	225	1,500	10	800	4,500	45	—
Devol loamy fine sand, 0 to 3 percent slopes	—	1,500	—	—	4,500	—	—
Dodson silt loam, 0 to 1 percent slopes	250	1,500	20	850	6,500	60	—
Dodson silt loam, 1 to 2 percent slopes	250	1,500	15	—	—	—	—
Gageby clay loam	300	2,000	20	850	6,500	60	6.0
Grandfield fine sandy loam, 0 to 1 percent slopes	300	2,000	25	850	6,500	50	5.5
Grandfield fine sandy loam, 1 to 3 percent slopes	250	1,500	20	800	6,000	50	4.5
Grandfield fine sandy loam, 3 to 5 percent slopes	225	1,250	20	—	4,500	—	4.5
Grandfield fine sandy loam, 3 to 5 percent slopes, eroded	100	750	10	—	—	—	—
Grandfield loamy fine sand, 0 to 3 percent slopes	250	1,500	15	800	4,500	50	—
Guadalupe fine sandy loam	300	2,000	20	850	6,500	60	6.0
Hardeman fine sandy loam, 3 to 5 percent slopes	150	1,000	10	—	3,500	—	—
Lutie silt loam, 1 to 3 percent slopes	200	1,000	15	700	5,500	55	—
Lutie silt loam, 3 to 5 percent slopes	200	1,000	15	—	3,500	—	—
Mansker and Portales soils, 1 to 3 percent slopes	150	1,000	10	—	—	—	—
Mansker and Portales soils, 3 to 5 percent slopes	100	750	10	—	—	—	—
Mobeetie fine sandy loam, 1 to 5 percent slopes	150	1,000	10	—	—	—	—
Obaro silt loam, 3 to 5 percent slopes, eroded	100	750	10	—	—	—	—
Paducah silt loam, 1 to 3 percent slopes	200	1,500	15	800	6,000	55	—
Paducah silt loam, 3 to 5 percent slopes	200	1,250	15	—	—	—	—
Pullman silty clay loam, 0 to 1 percent slopes	—	900	15	—	6,000	55	5.5
Tipton loam, 0 to 1 percent slopes	350	2,500	30	850	6,500	60	6.0
Tipton loam, 1 to 3 percent slopes	300	2,250	25	800	6,000	55	5.5
Veal fine sandy loam, 1 to 6 percent slopes	125	750	10	—	2,500	—	—

Range Management[3]

Ranching and livestock farming are important enterprises in Wheeler County. Native grassland covers about 415,000 acres. Of the total operating units in the county, 96 percent have 10 or more animal units of livestock for 6 months or more during the year.

There are 102 ranching units in the county that have more than a section, or 640 acres, of grassland. These units average 2,220 acres in size. In addition, there are 390 livestock operations that have less than a section of grassland. These operations average 283 acres in size. Ninety-five percent of all the units have some cropland that is used mainly for producing grazing or hay crops, such as grain sorghum, small grains, and forage sorghum. These crops are used in conjunction with the grazing of native range.

Livestock operations include cow-calf and, more commonly, stocker cattle enterprises. Of the 40 percent of the ranch units that run a cow-calf operation, many supplement their operations with winter stockers or carryover calves from the base herd during years of favorable forage production. Interest is growing in feedlot operations that use silage as the primary forage.

There are several kinds of grassland in the county. The most abundant is the Sandyland country of loamy fine sand soils that produce tall grasses. Bottom lands throughout the county and the rocky areas of sloping gyp outcrops produce short and mid grasses. Small areas of shallow soils produce sparse vegetation.

Range sites and range condition classes

Range sites are kinds of rangeland that differ from each other in their ability to produce a significant difference as to kinds and amounts of plants or in total annual yield. A significant difference is one that is great enough to require some variation in management, such as a different rate of stocking.

Differences in kinds, proportion, and production of plants that different sites are capable of supporting are a result, in large measure, of differences in environmental factors such as soil, topography, and climate.

[3] By DOUGLAS V. SELLARS, range conservationist, Soil Conservation Service, Pampa, Texas.

Therefore, range sites can be identified by the kinds of soil known to be capable of producing the distinctive potential plant community that characterizes a specific site.

Most of the native grassland of Wheeler County has been heavily grazed for several generations, and its original plant cover has been materially altered. Range condition is the present state of the vegetation of a range site in relation to the potential plant cover for that site. Four range condition classes are used to measure the degree to which the present plant composition, expressed in percent, resembles that of the potential plant community of a range site.

A range site is in *excellent* condition if 76 to 100 percent of the present vegetation is of the same kind as in the original stand. It is in *good* condition if the percentage is between 51 and 75, in *fair* condition if the percentage is between 26 and 50, and in *poor* condition if the percentage is less than 25.

To determine present range condition, plants are grouped in accord with their response to the kind of grazing use on specific range sites. These groups of plants are decreasers, increasers, and invaders.

Decreaser plants are species in the potential plant community that tend to decrease in relative abundance under moderately heavy to heavy grazing. Most of these plants have a high grazing preference and decrease from excessive use. The total of all such species is counted in determining range condition class.

Increaser plants are species present in the potential plant community that increase in relative abundance as the more desirable plants are reduced by moderately heavy to heavy grazing. Some increasers of moderately high grazing preference may initially increase and then decrease as grazing pressure continues. Others of low-grazing preference may continue to increase either in actual plant numbers or in relative proportions. Only the percentages of increaser plants normally expected to occur in the potential plant community are counted in determining range condition.

Invader plants are not part of the potential plant community. They invade the community as a result of various kinds of disturbance. They may be annuals or perennials or grasses, weeds, or woody plants. Some have high grazing value, but many are worthless. Invader plants are not counted in determining range condition class.

For most range sites and most range livestock operations, the higher the range condition class, the greater the quality and amount of available forage.

Descriptions of range sites

The 12 range sites that have been identified in Wheeler County are described in this subsection. Some of the mapping units in the county are made up of soils or land types that are placed in different range sites. To find the site in which a given soil or land type has been placed, refer to the "Guide to Mapping Units" at the back of this survey.

DEEP HARDLAND RANGE SITE

This site consists of deep, nearly level to gently sloping, loamy soils. Permeability is moderate to very slow.

In the climax plant community, blue grama makes up about 50 percent of the composition, by weight; buffalograss, 15 percent; western wheatgrass, 10 percent; side-oats grama, 5 percent; vine-mesquite, 5 percent; silver bluestem, 5 percent; plains actinea, 5 percent; and annual forbs, 5 percent.

Recovery of deteriorated range can be speeded up by reseeding to desirable grasses and then by deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,200 pounds in unfavorable years to 2,200 pounds in favorable years. About 95 percent of this vegetation is suitable for use by livestock and wildlife.

DEEP SAND RANGE SITE

This site consists of deep, gently sloping to steep and duned, sandy soils. Permeability is rapid.

In the climax plant community, little bluestem makes up about 10 percent of the composition, by weight; sand bluestem, 10 percent; switchgrass, 10 percent; sand lovegrass, 10 percent; shin oak, 10 percent; indiangrass, 5 percent; side-oats grama, 5 percent; three-awns, 5 percent; sand dropseed, 5 percent; big sandreed, 5 percent; sandplum, 5 percent; skunkbush, 5 percent; annual grasses, 5 percent; and annual forbs, 10 percent.

The plant cover deteriorates rapidly under heavy grazing, but the plants respond to good grazing management. Recovery of deteriorated range can be speeded up by reseeding or brush control, or both, and then by deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,400 pounds in unfavorable years to 3,400 pounds in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

GYPLAND RANGE SITE

This site consists of gently sloping and undulating outcrops of gypsum and very shallow, loamy soils. Permeability is moderate.

In the climax plant community, side-oats grama makes up about 25 percent of the composition, by weight; little bluestem, 20 percent; dotted gayfeather, 10 percent; blue grama, 10 percent; hairy grama, 10 percent; sand bluestem, 5 percent; black sampson, 5 percent; rough tridens, 5 percent; annual grasses, 5 percent; and annual forbs, 5 percent.

Control of grazing is the primary way to maintain or improve this site.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 500 pounds in unfavorable years to 1,100 pounds in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

HARDLAND SLOPES RANGE SITE

This site consists of deep, gently sloping to moderately steep and rolling, loamy soils. Permeability is moderate.

In the climax plant community, side-oats grama makes up about 40 percent of the composition, by weight; blue grama, 20 percent; little bluestem, 15 percent; buffalograss, 5 percent; three-awns, 5 percent;

sand dropseed, 5 percent; annual grasses, 5 percent; and annual forbs, 5 percent.

Improvement of the plant cover can be speeded up by reseeding and deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,300 pounds in unfavorable years to 2,200 pounds in favorable years. About 90 percent of this vegetation is suited for use by livestock and wildlife.

LOAMY BOTTOMLAND RANGE SITE

This site consists of deep, nearly level to gently sloping, loamy soils that are on flood plains along streams. These soils receive runoff water from adjacent slopes, and some areas are subject to flooding and deposition of sediment. Permeability is moderately slow to moderately rapid.

In the climax plant community, switchgrass makes up about 20 percent of the composition, by weight; indiangrass, 15 percent; western wheatgrass, 10 percent; little bluestem, 5 percent; side-oats grama, 5 percent; Canada wildrye, 5 percent; eastern gamagrass, 5 percent; alkali sacaton, 5 percent; tall dropseed, 5 percent; sedges, 5 percent; inland saltgrass, 5 percent; annual forbs, 5 percent; annual grasses, 5 percent; and woody plants, chiefly cottonwood and hackberry, 5 percent.

Recovery of deteriorated range in this site generally can be accomplished by reseeding and then by deferment of grazing. Seeding is not feasible, however, in areas that are flooded or have a high water table.

If this site is in excellent condition, the estimated annual yields per acre of air-dry herbage ranges from 2,000 pounds in unfavorable years to 3,400 pounds per acre in favorable years in areas that are saline or have a low water table. The estimated yields range from 3,200 pounds per year in unfavorable years to 4,000 pounds per year in favorable years in areas that have a high water table. About 95 percent of this vegetation is suitable for use by livestock and wildlife.

MIXEDLAND RANGE SITE

This site consists of nearly level to strongly sloping and undulating to rolling, loamy soils. These soils are deep to shallow. The drainage pattern is well defined. Permeability is moderate to moderately rapid.

In the climax plant community, side-oats grama makes up about 25 percent of the composition, by weight; blue grama, 20 percent; little bluestem, 15 percent; vine-mesquite, 5 percent; buffalograss, 5 percent; silver bluestem, 5 percent; sand dropseed, 5 percent; hairy grama, 5 percent; annual grasses, 5 percent; and annual forbs, 10 percent.

Recovery of deteriorated range can be accomplished by brush control, reseeding adapted grasses, and deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,600 pounds in unfavorable years to 2,200 pounds in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

MIXEDLAND SLOPES RANGE SITE

This site consists of deep, gently sloping to sloping, loamy soils on uplands. Permeability is moderate.

In the climax plant community, little bluestem makes up about 25 percent of the composition, by weight; side-oats grama, 20 percent; blue grama, 15 percent; sand bluestem, 10 percent; buffalograss, 5 percent; sand dropseed, 5 percent; sand sagebrush, 5 percent; yucca, 5 percent; annual grasses, 5 percent; and annual forbs, 5 percent.

Recovery of deteriorated range can be speeded up by seeding and then by deferment of grazing. Areas in which sand sagebrush has invaded can be improved by brush control and deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,600 pounds in unfavorable years to 2,200 pounds in favorable years. About 90 percent of this forage is suitable for use by livestock and wildlife.

ROUGH BREAKS RANGE SITE

This site consists of sloping to very steep, rocky and loamy materials on valley escarpments, on ridges, and in gullied areas. Some areas of the site are not accessible to livestock.

In the climax plant community, little bluestem makes up about 25 percent of the composition, by weight; side-oats grama, 20 percent; sand bluestem, 10 percent; switchgrass, 10 percent; hairy grama, 10 percent; indiangrass, 5 percent; skunkbush, 5 percent; annual grasses, 5 percent; and annual forbs, 10 percent.

Recovery of deteriorated range can best be accomplished by deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 400 pounds in unfavorable years to 900 pounds in favorable years. Some 20 to 60 percent of this forage is suitable for use by and available to livestock and wildlife.

SANDY BOTTOMLAND RANGE SITE

This site consists of deep, nearly level to gently sloping, sandy soils on flood plains along streams and the North Fork of the Red River. A water table is at a depth of 5 to 10 feet in some areas. Some areas are subject to occasional flooding. Permeability is rapid.

In the climax plant community, switchgrass makes up about 25 percent of the composition, by weight; indiangrass, 20 percent; sand bluestem, 10 percent; little bluestem, 10 percent; side-oats grama, 5 percent; Canada wildrye, 5 percent; silver bluestem, 5 percent; inland saltgrass, 5 percent; plains cottonwood, 5 percent; annual grasses, 5 percent; and annual forbs, 5 percent.

Recovery of deteriorated range can be speeded up by seeding to desirable grasses and then by deferment of grazing. Seeding is questionable in flooded areas of this site.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,800 pounds per year in unfavorable years to 3,000 pounds per year in favorable years in areas that have no water table and from 2,200 pounds in unfavorable years to 3,500 pounds in favorable years in areas that have a

Figure 16.—**Sandyland range site in good condition. In foreground is Grandfield loamy fine sand, 0 to 3 percent slopes, and on the dunes in background is Tivoli fine sand.**

water table. About 95 percent of this vegetation is suitable for use by livestock and wildlife.

SANDYLAND RANGE SITE

This site consists of deep, nearly level to sloping, sandy soils. Permeability is moderate or moderately rapid (fig. 16).

In the climax plant community, little bluestem makes up about 15 percent of the composition, by weight; switchgrass, 10 percent; side-oats grama, 10 percent; sand bluestem, 10 percent; indiangrass, 5 percent; sand lovegrass, 5 percent; blue grama, 5 percent; three-awns, 5 percent; sand dropseed, 5 percent; sand sagebrush, 5 percent; shin oak, 5 percent; skunkbush, 5 percent; annual grasses, 5 percent; and annual forbs, 10 percent.

Recovery of deteriorated range can be speeded up by seeding. Where conditions are less severe, recovery can be accomplished by brush control and deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 2,200 pounds in unfavorable years to 3,500 pounds in favorable years. About 90 percent of this forage is suitable for use by livestock and wildlife.

SANDY LOAM RANGE SITE

This site consists of deep, nearly level to sloping and rolling, loamy soils on plains. Permeability is moderate to moderately rapid. If the soils are not protected by plant cover, hoofpans commonly form and the surface crusts.

In the climax plant community, side-oats grama makes up about 20 percent of the composition, by weight; blue grama, 15 percent; little bluestem, 10 percent; switchgrass, 10 percent; sand bluestem, 5 percent; indiangrass, 5 percent; Canada wildrye, 5 percent; buffalograss, 5 percent; sand dropseed, 5 percent; sand sagebrush, 5 percent; annual grasses, 5 percent; and annual forbs, 10 percent.

Recovery of deteriorated range can be speeded up by interseeding desirable grasses. Brush control followed by deferment of grazing can improve areas invaded by sand sagebrush.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 1,800 pounds in unfavorable years to 2,550 pounds in favorable years. About 90 percent of this vegetation is suitable for use by livestock and wildlife.

VERY SHALLOW RANGE SITE

This site consists of very shallow, gently sloping to moderately steep and rolling, loamy soils along caprock escarpments, on ridges and knobs, and in convex areas. Caliche gravel or rock is exposed in many places. Permeability is moderate.

In the climax plant community, side-oats grama makes

up about 20 percent of the composition, by weight; little bluestem, 15 percent; switchgrass, 10 percent; sand bluestem, 5 percent; indiangrass, 5 percent; dotted gayfeather, 5 percent; black sampson, 5 percent; hairy grama, 5 percent; blue grama, 5 percent; three-awns, 5 percent; rough tridens, 5 percent; annual grasses, 5 percent; and annual forbs, 10 percent.

Recovery of deteriorated range can be speeded up by deferment of grazing.

If this site is in excellent condition, the estimated annual yield per acre of air-dry herbage ranges from 400 pounds in unfavorable years to 850 pounds in favorable years. About 90 percent of this forage is suitable for use by livestock and wildlife.

Use of the Soils For Wildlife[4]

Wildlife has become an important source of recreation and income in some areas of Wheeler County. Many small ranches and farm-ranch enterprises have leased hunting rights, mainly to nonresidents.

Bobwhite quail and some blue quail are hunted in the same areas. Doves and waterfowl offer good hunting during most seasonal migrations. Whitetailed deer are increasingly important as a source of recreation and revenue, and prairie chicken and wild turkey have also become important hunting attractions. Other animals present in the county are coyote, bobcat, jackrabbit, cottontail rabbit, badger, skunk, raccoon, opossum, small rodents, lizards, beaver, and snakes. The rattlesnake is the only poisonous snake in this county.

Fishing is limited mainly to farm ponds. Most ponds are so small that fish production is limited and does not provide extra income for many landowners or operators. Large-mouth bass, sunfish, crappie, and channel catfish are stocked in these ponds.

Successful management of wildlife on any tract of land requires, among other things, that food, cover, and water be available in a suitable combination. A lack of any one of these necessities, an unfavorable balance among them, or an inadequate distribution of them can severely limit or account for the absence of desired wildlife species. Information about the soils in Wheeler County provides a valuable tool in creating, improving, or maintaining suitable food, cover, and water for wildlife.

Most wildlife habitats are managed by planting suitable vegetation; by manipulating existing vegetation to bring about a natural establishment, an increase, or an improvement of desired plants; or by combinations of such measures. The influence of a soil on the growth of plants is known for many plants and can be inferred for others from a knowledge about the characteristics and behavior of the soil. In addition, water areas can be created or natural ones improved as wildlife habitats.

Soil interpretations for wildlife habitat serve a variety of purposes. They are an aid in selecting the more suitable sites for various kinds of habitat. They serve as indicators of the level of management intensity needed to achieve satisfactory results. They can also show why it may not be feasible generally to manage a particular area for a given kind of wildlife. These interpretations can serve in broad-scale planning of wildlife management areas, parks, and nature areas, or for acquiring wildlife lands.

Soil properties that affect the development of wildlife habitat are thickness of soil useful to plants, texture of the surface layer, available water capacity to a depth of 40 inches, wetness, surface stoniness or rockiness, flood hazard, and slope.

Table 3 shows the suitability of each soil in Wheeler County for the creation, improvement, or maintenance of six elements of wildlife habitat and for three kinds of wildlife. Ratings are based on limitations imposed by the characteristics or behavior of the soil. The size, shape, and location of mapped areas of a soil do not affect the rating, nor does the position of the soil in relation to other kinds of soil. Certain factors that influence habitats, such as elevation and aspect, must be appraised at the site.

Following are definitions for the suitability ratings used in table 3.

Well suited indicates the habitats generally are easily created, improved, or maintained; that the soil has few or no limitations that affect management; and that satisfactory results can be expected.

Suited indicates that habitats can be created, improved, or maintained in most places; that the soil has moderate limitations that affect management; and that moderate intensity of management and fairly frequent attention may be required for satisfactory results.

Poorly suited indicates that the habitats can be created, improved, or maintained in most places; that the soil has rather severe limitations; that habitat management is difficult and expensive and requires intensive effort; and that results are not always satisfactory. For short-term use, these soils can provide easy establishment of temporary habitat elements.

Unsuited indicates that the soil limitation is so extreme that it is impractical, if not impossible, to manage the designated habitat element. Unsatisfactory results are probable.

The six habitat elements rated in table 3 are defined and exemplified as follows:

Grain and seed crops.—Agricultural grains or seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghums, millets, soybeans, wheat, oats, and sunflower.

Grasses and legumes.—Domestic perennial grasses and legumes that are established by planting and that furnish food and cover for wildlife. Examples are ryegrass, fescue, plains bristlegrass, blue panic, and switchgrass. Legumes include clovers, alfalfa, and quail bean.

Wild herbaceous plants.—Perennial grasses, forbs, and weeds that provide food and cover for wildlife. Examples of these are beggarweed, perennial lespedezas, wildbean, indiangrass, wild ryegrass, and bluestems.

Hardwood trees and shrubs.—Nonconiferous trees, shrubs, and woody vines that produce nuts, other fruits, buds, catkins, or foliage (browse) used extensively as food by wildlife. These plants commonly become established through natural processes, but they can be planted. Examples are oak, mesquite, woollybucket

[4] By JAMES HENSON, biologist, Soil Conservation Service, San Angelo, Texas.

bumelia, black locust, catclaw, cherry grape, honeysuckle, hackberry, and sumac.

Wetland food and cover plants.—Annual and perennial wild herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatics, that produce food or cover that is extensively and dominantly used by wetland forms of wildlife. Examples are smartweed, wild millet, bulrush, spike sedge, rushes, sedges, burreeds, wild rice cutgrass, sourdock, and cattails.

Shallow water developments.—Low dikes and water control structures established to create habitat principally for waterfowl. They can be designed to be drained, planted, and flooded or they can be used as permanent impoundments to grow submerged aquatics. Only freshwater situations are included.

The three general kinds of wildlife in table 3 are defined as follows:

Openland wildlife is birds and mammals that commonly frequent cropland, pastures, and areas overgrown with grasses, herbs, and shrubby growth. Examples of this kind of wildlife are quail, prairie chicken, cottontail rabbit, jackrabbit, meadowlark, and lark sparrow.

Brushland wildlife is birds and mammals that commonly frequent wooded areas of hardwood trees and shrubs. Examples of brushland wildlife are deer, turkey, squirrel, and raccoon.

Wetland wildlife is birds and mammals that commonly frequent such areas as ponds, streams, ditches, marshes, and swamps. Examples of this kind of wildlife are ducks, geese, rails, shorebirds, and snipe.

Engineering Uses of the Soils[5]

Some properties are of special interest to engineers, contractors, farmers, and others who use soil as structural material or as foundation material upon which structures are built. These properties affect construction and maintenance of roads and airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties most important in engineering are permeability, compressibility, shear strength, density, shrink-swell potential, water-holding capacity, grain-size distribution, plasticity, and reaction.

Information concerning these and related soil properties is given in tables 4 and 5. The estimates and interpretations of soil properties in these tables can be used in—

1. Planning agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Selecting potential locations for highways, airports, pipelines, and underground cables.
3. Locating probable sources of sand, gravel, or rock suitable for use as construction material.
4. Selecting potential industrial, commerical, residential, and recreational areas.
5. Correlating performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predicting the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Developing preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 4 and 5, which show, respectively, several estimated soil properties significant to engineering and interpretations of engineering properties of the soils for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to these given in tables 4 and 5, and it also can be used to make other useful maps.

These engineering interpretations do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported, generally depths greater than 5 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other soils that have contrasting characteristics and that may have different engineering properties than those listed. The estimated values for traffic-supporting capacity expressed in words should not be assigned specific values. Even with these limitations, however, the soil map is useful in planning more detailed field investigations and for indicating the kinds of problems that may be expected.

Some terms used by soil scientists may be unfamiliar to engineers, and some words have different meanings in soil science than they have in engineering. Among the terms that have special meaning in soil science are gravel, sand, silt, clay, loam, surface soils, subsoil, and horizon. These and other terms are defined in the Glossary at the back of the report.

Engineering classification of the soils

The two systems most commonly used in classifying samples of soil horizons for engineering are the AASHO system[6] adopted by the American Association of State Highway Officials and the Unified Soil Classification System[7] used by the SCS engineers, Department of Defense, and others.

The AASHO system is used to classify soils according to those properties that affect use in highway construction. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing capacity, or the best soils for subgrade (foundation), and, at the other extreme, clay soils that have low strength when wet. The best soils for subgrade are therefore classified as A-1, the next best A-2, and so on to class A-7, the poorest soils for subgrade. Where

[5] By JOHN W. JACKSON, agricultural engineer, Soil Conservation Service, Pampa, Texas.

[6] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 V., illus. 1961.

[7] UNITED STATES DEPARTMENT OF DEFENSE. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL-STD-619B, 30 pp., illus. 1968.

TABLE 3.—*Suitability of the soils for wildlife*

Soil series and map symbols	Wildlife habitat elements		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants
Abilene: AbA, AbB, AbC	Well suited	Well suited	Well suited
Altus: Af	Well suited	Well suited	Well suited
Berda, dark surface variant: BeC	Well suited	Well suited	Well suited
Berda: BmD, BpD For Mansker part of BmD and Potter part of BpD, see their respective series.	Well suited	Well suited	Well suited
Bippus: BrA, BrB, BrC	Well suited	Well suited	Well suited
Blown-out land: Bt For Tivoli part, see Tivoli series.	Unsuited	Unsuited	Poorly suited
Carey: CaA, CaB	Well suited	Well suited	Well suited
Clairemont: Cm	Suited	Well suited	Well suited
Cobb: CoB, CoC	Well suited	Well suited	Well suited
Cottonwood Mapped only in an undifferentiated unit with the Lutie series.	Well suited	Well suited	Well suited
Delwin: DeB, DfC3	Suited	Suited	Poorly suited
Devol: DlB, DlD, DmC3	Suited	Well suited	Well suited
Dodson: DoA, DoB	Well suited	Well suited	Well suited
Gageby: Ga	Suited	Well suited	Well suited
Grandfield: GdB, GdD, GrD3	Well suited	Well suited	Well suited
GfA, GfB, GfC, GfC2	Well suited	Well suited	Well suited
Guadalupe: Gu	Suited	Well suited	Well suited
Gypsum outcrop: GyC For Quinlan part, see Quinlan series.	Unsuited	Unsuited	Unsuited
Hardeman: HaC, HaD	Well suited	Well suited	Well suited
Likes: LkB	Suited	Well suited	Well suited
Lincoln: Ln	Poorly suited	Suited	Suited
Lutie: LuB, LuC, LwB For Cottonwood part of LwB, see Cottonwood series.	Well suited	Well suited	Well suited
Mansker: MaB, MaC For Portales part of MaB and MaC, see Portales series.	Well suited	Well suited	Well suited
Mobeetie: MrC, MrD, MsD For Potter part of MsD, see Potter series.	Suited	Well suited	Well suited
Obaro: ObC2, OuD For Quinlan part of OuD, see Quinlan series.	Suited	Well suited	Well suited
Paducah: PaB, PaC	Well suited	Well suited	Well suited
Portales Mapped only in an undifferentiated unit with the Mansker series.	Well suited	Well suited	Well suited
Potter: PoB, PrE For Berda part of PrE, see Berda series.	Unsuited	Unsuited	Poorly suited
Pratt: PtB	Poorly suited	Suited	Poorly suited
Pullman: PuA	Well suited	Well suited	Well suited
Quinlan Mapped only in undifferentiated units with Gypsum outcrop and the Obaro series.	Poorly suited	Suited	Suited
Rough broken land: Ro	Unsuited	Unsuited	Poorly suited
Sweetwater: Sw	Poorly suited	Suited	Suited
Tipton: TpA, TpB	Well suited	Well suited	Well suited
Tivoli: Tv	Poorly suited	Suited	Poorly suited
Veal: VeC	Well suited	Well suited	Well suited

habitat elements and kinds of wildlife

Wildlife habitat elements—Continued			Kinds of Wildlife		
Hardwood trees and shrubs	Wetland food and cover plants	Shallow water developments	Openland	Brushland	Wetland
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Unsuited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Poorly suited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Well suited	Well suited	Suited	Poorly suited	Well suited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Poorly suited	Unsuited.

TABLE 4.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series that

Soil series and map symbols	Hydrologic soil group	Depth from surface	Classification		
			USDA texture	Unified	AASHO
		In.			
Abilene: AbA, AbB, AbC	C	0–12	Clay loam	CL	A–6
		12–56	Clay loam	CL	A–7–6
		56–85	Clay loam	CL	A–6, A–7–6
Altus: Af	B	0–8	Fine sandy loam	SM, ML	A–2, A–4
		8–55	Sandy clay loam	SC, CL	A–4, A–6
Berda, dark surface variant: BeC	B	0–65	Loam	SC, CL	A–4, A–6
*Berda: BmD, BpD	B	0–60	Loam	SC, CL	A–4, A–6
For Mansker soil in BmD and Potter soil in BpD, see their respective series.					
Bippus: BrA, BrB, BrC	B	0–65	Clay loam	SM–SC, SC, CL	A–4, A–6
*Blown-out land: Bt. Properties too variable to be estimated. For properties of Tivoli soil, see the Tivoli series.					
Carey: CaA, CaB	B	0–14	Silt loam	ML, ML–CL	A–4
		14–48	Silty clay loam	CL, ML–CL	A–4, A–6
		48–80	Silt loam	SM, ML–CL	A–4
Clairemont: Cm	B	0–60	Silt loam, silty clay loam, loam.	CL, ML–CL	A–6
Cobb: CoB, CoC	B	0–16	Loamy fine sand	SM	A–2–4
		16–38	Sandy clay loam	SC, CL	A–6
		38–50	Very fine sandy loam	ML, CL	A–4
		50–65	Very fine sandy loam, with fractured rock structure.	ML, CL	A–4
Cottonwood	C	0–8	Silt loam	ML–CL	A–6
Mapped only in an undifferentiated unit with the Lutie soils.			Weakly cemented gypsum.		
Delwin: DeB, DfC3	A	0–16	Fine sand	SM, SM–SC	A–3, A–2–4
		16–80	Sandy clay loam	SC, SM	A–2–4, A–6, A–2–6
Devol: DlB, DlD, DmC3	B	0–16	Loamy fine sand	SM	A–2–4, A–4
		16–25	Fine sandy loam	SM, ML	A–2–4, A–4
		25–86	Loamy fine sand, loamy sand	SM	A–2–4, A–4
Dodson: DoA, DoB	C	0–8	Silt loam	ML–CL, CL	A–4, A–6
		8–24	Silty clay loam	CL	A–6
		24–86	Silty clay loam	CL	A–6, A–6–7
Gageby: Ga	B	0–45	Clay loam	CL, ML	A–6
		45–65	Loamy sand	SM, SM–SC	A–2–4
Grandfield: GdB, GdD, GfA, GfB, GfC, GfC2, GrD3.	B	0–8	Loamy fine sand or fine sandy loam.	SM–SC, SM	A–2, A–4
		8–38	Sandy clay loam	SC, CL	A–4, A–6
		38–68	Fine sandy loam	SM, SC, SM–SC	A–2, A–4
		68–80	Loamy sand	SM	A–2, A–4
Guadalupe: Gu	B	0–36	Fine sandy loam	SM, SM–SC	A–4, A–2–4
		36–54	Clay loam	SC, CL	A–6
		54–65	Sandy loam	SM, SM–SC	A–4, A–2–4
*Gypsum outcrop: GyC. Properties too variable to be estimated. For properties of Quinlan soils in GyC, see Quinlan series.					
Hardeman: HaC, HaD	B	0–48	Fine sandy loam	SM–SC, ML–CL	A–4
		48–80	Loamy fine sand	SM	A–4, A–2

significant to engineering

soils in such mapping units have different properties and limitations, and for this reason it is necessary to follow carefully the appear in the first column of this table]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
				In. per hr.	*In. per in. of soil*	*pH*	
100	100	95–99	75–95	0.60–2.0	0.15–0.19	6.6–7.3	Moderate.
100	100	95–99	90–95	0.20–0.60	0.14–0.18	7.4–8.4	Moderate.
100	90–100	90–98	70–92	0.20–0.60	0.12–0.16	7.9–8.4	Moderate.
100	100	90–100	30–60	0.60–2.0	0.09–0.13	6.6–7.3	Low.
100	100	90–100	40–60	0.60–2.0	0.12–0.16	6.6–8.4	Low.
95–100	95–100	80–95	40–60	0.60–2.0	0.14–0.17	7.9–8.4	Low.
90–100	80–100	80–95	36–70	0.60–2.0	0.14–0.17	7.9–8.4	Low.
100	95–100	80–100	36–70	0.60–2.0	0.16–0.20	7.4–8.4	Low.
100	100	95–100	51–90	0.60–2.0	0.16–0.20	6.6–7.3	Low.
100	100	95–100	60–95	0.60–2.0	0.14–0.18	7.9–8.4	Low.
100	95–100	95–100	40–65	0.60–2.0	0.15–0.19	7.9–8.4	Low.
100	100	100	85–98	0.60–2.0	0.16–0.19	7.9–8.4	Low.
100	98–100	75–90	15–30	2.0–6.0	0.06–0.10	7.4–7.8	Low.
95–100	90–99	90–98	40–60	0.60–2.0	0.12–0.16	7.4–7.8	Low.
95–99	90–99	90–98	55–65	0.60–2.0	0.14–0.18	7.4–7.8	Low.
95–99	90–99	90–98	60–75	0.60–2.0	0.04–0.08	7.4–7.8	Low.
100	100	90–100	65–75	0.60–2.0	0.11–0.14	7.9–8.4	Low.
100	100	85–100	13–20	6.0–20.0	0.04–0.08	6.1–6.5	Low.
100	100	90–100	13–45	0.60–2.0	0.14–0.16	6.6–7.3	Low.
100	100	50–75	30–50	2.0–6.0	0.06–0.09	6.6–7.3	Low.
100	100	70–85	30–60	2.0–6.0	0.09–0.13	7.4–7.8	Low.
100	100	50–75	30–50	2.0–6.0	0.06–0.09	7.4–8.4	Low.
100	100	95–100	70–90	0.60–2.0	0.16–0.19	6.6–7.3	Low.
98–100	95–100	85–95	60–85	0.20–0.60	0.15–0.19	7.4–7.8	Moderate.
100	100	95–99	65–90	0.20–0.60	0.15–0.19	7.9–8.4	Moderate.
100	100	95–98	80–90	0.60–2.0	0.16–0.20	7.9–8.4	Low.
70–100	65–100	50–75	15–30	6.0–20.0	0.06–0.09	7.9–8.4	Low.
100	100	90–100	30–50	2.0–6.0	0.09–0.13	6.6–7.3	Low.
100	100	90–100	40–60	0.60–2.0	0.12–0.16	6.6–7.3	Low.
100	100	90–100	30–50	2.0–6.0	0.09–0.13	7.4–7.8	Low.
100	100	90–100	30–50	2.0–6.0	0.06–0.09	7.4–7.8	Low.
95–100	95–100	75–85	30–45	2.0–6.0	0.10–0.13	7.9–8.4	Low.
95–100	95–100	75–85	45–65	2.0–6.0	0.10–0.14	7.9–8.4	Low.
95–100	95–100	75–85	30–45	2.0–6.0	0.10–0.13	7.8–8.4	Low.
95–100	90–100	85–95	40–65	2.0–6.0	0.10–0.13	7.4–8.4	Low.
100	100	50–75	30–50	2.0–6.0	0.06–0.09	7.8–8.4	Low.

TABLE 4.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth from surface	Classification		
			USDA texture	Unified	AASHO
		In.			
Likes: LkB	A	0–60	Loamy fine sand, loamy sand	SM–SC	A–2–4
Lincoln: Ln	A	0–6	Loamy fine sand	SM	A–4
		6–60	Fine sand	SM	A–2
*Lutie: LuB, LuC, LwB	B	0–11	Silt loam	CL, ML–CL	A–6
For properties of Cottonwood soil in LwB, see Cottonwood series.		11–30	Silty clay loam	CL	A–6
		30–80	Silty clay loam, silt loam	ML, CL	A–4, A–6
*Mansker: MaB, MaC	B	0–10	Loam	CL, ML, SC	A–4, A–6
For properties of Portales soil in MaB and MaC, see Portales series.		10–60	Clay loam	CL, SC, ML	A–6
		60–73	Loam	CL, ML, SC	A–4, A–6
*Mobeetie: MrC, MrD, MsD	B	0–36	Fine sandy loam	ML–CL, SM, SM–SC	A–4
For properties of Potter soils in MsD, see Potter series.		36–60	Loamy fine sand	SM–SC	A–2–4
*Obaro: ObC2, OuD	B	0–31	Silt loam	ML–CL, CL	A–4, A–6
For properties of Quinlan soils in OuD, see Quinlan series.		31–65	Weakly cemented sandstone	ML–CL	A–4
Paducah: PaB, PaC	B	0–8	Silt loam	ML, ML–CL	A–4
		8–30	Clay loam	ML–CL	A–4
		30–40	Very fine sandy loam	ML–CL	A–4
		40–60	Very fine sandy loam and partially weathered, weakly cemented redbed sandstone.	ML–CL	A–4
Portales	B	0–40	Clay loam	CL, SC	A–6
Mapped only in an undifferentiated unit with the Mansker series.		40–65	Sandy clay loam	CL, SC	A–6
*Potter: PoB, PrE	C	0–8	Loam	ML, CL	A–6, A–4
For properties of Berda soils in PrE, see Berda series.		8–60	Slightly platy caliche, soft caliche, and loamy materials.	GM, GC, SM, SC	A–2, A–4, A–6
Pratt: PtB	A	0–25	Fine sand	SM–SP	A–3
		25–86	Loamy sand	SM–SP	A–3
Pullman: PuA	D	0–7	Silty clay loam	CL	A–7–6
		7–52	Clay	CL, CH	A–7
		52–80	Silty clay loam	CL	A–7–6
Quinlan	C	0–15	Silt loam	ML, CL	A–4
Mapped only in undifferentiated units with Gypsum outcrop and the Obaro series.		15–65	Weakly cemented sandstone.		
Rough broken land: Ro. Properties too variable to be estimated.					
Sweetwater: Sw	D	0–20	Silty clay loam or sandy clay loam.	ML, CL, SC	A–6
		20–60	Loamy fine sand	SM	A–2–4
Tipton: TpA, TpB	B	0–6	Loam	ML, CL	A–4
		6–45	Clay loam	CL	A–6
		45–65	Sandy clay loam	SC, CL	A–6, A–4
Tivoli: Tv	A	0–60	Fine sand	SP–SM, SM	A–3
Veal: VeC	B	0–18	Fine sandy loam	SM, SC	A–2–4, A–4
		18–70	Sandy clay loam	CL, SC	A–6
		70–80	Fine sandy loam	SM–SC, SC, CL	A–4

significant to engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
				In. per hr.	*In. per in. of soil*	*pH*	
90–98	90–98	75–95	13–30	2.0–6.0	0.06–0.10	7.9–8.4	Low.
100	100	50–90	36–50	6.0–20.0	0.06–0.09	7.9–8.4	Low.
100	90–100	50–90	15–35	6.0–20.0	0.04–0.06	7.9–8.4	Low.
95–100	95–100	95–99	85–95	0.60–2.0	0.14–0.17	7.9–8.4	Low.
100	95–100	95–98	85–95	0.60–2.0	0.15–0.18	7.9–8.4	Low.
90–100	90–100	85–100	75–95	0.60–2.0	0.14–0.17	7.9–8.4	Low.
95–100	95–100	80–95	40–60	0.60–2.0	0.14–0.18	7.9–8.4	Low.
90–100	90–100	85–95	40–80	0.60–2.0	0.12–0.16	7.9–8.4	Low.
95–100	95–100	80–95	40–60	0.60–2.0	0.14–0.18	7.9–8.4	Low.
95–98	90–95	85–95	40–65	2.0–6.0	0.10–0.13	7.9–8.4	Low.
90–98	90–98	75–95	13–30	2.0–6.0	0.06–0.10	7.9–8.4	Low.
95–98	92–97	90–96	75–85	0.60–2.0	0.12–0.16	7.9–8.4	Low.
95–99	90–99	90–98	60–75	0.60–2.0	0.04–0.08	7.9–8.4	Low.
100	100	95–100	51–90	0.60–2.0	0.16–0.20	7.4–7.8	Low.
100	96–99	95–99	55–65	0.60–2.0	0.15–0.19	7.4–7.8	Low.
100	100	95–100	55–65	0.60–2.0	0.14–0.18	7.9–8.4	Low.
95–99	90–99	90–98	60–75	0.60–2.0	0.04–0.08	7.9–8.4	Low.
98–100	95–100	85–95	45–70	0.60–2.0	0.15–0.17	7.9–8.4	Low.
100	100	90–100	40–60	0.60–2.0	0.12–0.16	7.9–8.4	Low.
80–95	70–90	60–85	51–70	0.60–2.0	0.12–0.16	7.9–8.4	Low.
30–80	25–75	20–60	13–50	0.60–2.0	0.01–0.14	7.9–8.4	Low.
100	100	50–90	5–10	6.0–20.0	0.04–0.06	6.1–6.5	Low.
100	100	50–90	5–10	6.0–20.0	0.04–0.06	6.1–7.3	Low.
100	100	95–100	70–90	0.2–0.60	0.14–0.18	7.4–7.8	Moderate.
100	100	95–100	80–95	<0.06	0.12–0.16	7.4–8.4	High.
95–100	90–100	90–100	80–95	0.06–0.20	0.12–0.16	7.9–8.4	Moderate.
100	100	90–100	55–85	2.0–6.0	0.12–0.16	7.9–8.4	Low.
100	95–100	80–95	40–70	0.20–0.60	0.16–0.20	7.9–8.4	Low.
95–100	90–100	50–80	15–35	6.0–20.0	0.04–0.10	7.9–8.4	Low.
100	100	95–100	55–75	0.60–2.0	0.12–0.16	6.6–7.3	Low.
100	100	95–100	75–85	0.60–2.0	0.15–0.19	6.6–8.4	Moderate.
95–100	95–100	80–95	40–60	0.60–2.0	0.12–0.16	7.9–8.4	Low.
100	100	85–95	9–20	6.0–20.0	0.04–0.06	6.1–7.8	Low.
95–100	95–100	85–95	30–50	2.0–6.0	0.10–0.14	7.9–8.4	Low.
95–100	95–100	90–100	40–70	0.60–2.0	0.12–0.16	7.9–8.4	Low.
95–98	90–95	85–95	40–65	2.0–6.0	0.10–0.14	7.9–8.4	Low.

TABLE 5.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The the instructions for referring to other series

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
Abilene: AbA, AbB, AbC	Fair: clay loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	Slight	Moderate: moderately slow permeability.
Altus: Af	Fair: surface layer is 6 to 18 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
Berda, dark surface variant: Bec.	Good	Fair: fair traffic supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability; slopes of 3 to 5 percent.	Moderate: moderate permeability.
*Berda: BmD, BpD For Mansker soil in BmD and Potter soil in BpD, see their respective series.	Good where slopes are 5 to 8 percent. Fair where slopes are 8 to 15 percent.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; slopes of as much as 15 percent in places.	Slight where slopes are 5 to 8 percent. Moderate where slopes are 8 to 15 percent.	Slight where slopes are 5 to 8 percent. Moderate where slopes are 8 to 15 percent.	Moderate where slopes are 5 to 7 percent: moderate permeability. Severe where slopes are 7 to 15 percent.	Moderate: moderate permeability.
Bippus: BrA, BrB, BrC	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
*Blown-out land: Bt. No interpretations made for Blown-out land; properties too variable. For Tivoli soil, see Tivoli series.							
Carey: CoA, CoB	Fair: surface layer is 11 to 19 inches of silt loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
Clairemont: Cm	Fair: silt loam surface layer.	Fair: fair traffic-supporting capacity.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderate permeability.	Moderate: moderate permeability.
Cobb: CoB, CoC	Poor: loamy fine sand surface layer.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.

engineering properties of soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully that appear in the first column of this table]

Degree of limitations and soil features affecting—Continued					Soil features affecting—			Corrosivity class and soil features for uncoated steel
Farm ponds—Continued Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Moderate: fair resistance to piping and erosion.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer; moderately slow permeability.	Moderate: clay loam surface layer.	Low intake rate.	All features favorable.	All features favorable.	Moderate: clay loam.
Slight	Slight	Slight	Slight	Slight	High intake rate.	All features favorable.	All features favorable.	Low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate: slopes of 3 to 5 percent.	Slight	Gently sloping.	All features favorable.	All features favorable.	Moderate: conductivity.
Moderate: fair resistance to piping and erosion.	Slight where slopes are 5 to 8 percent. Moderate where slopes are 8 to 15 percent.	Slight where slopes are 5 to 8 percent. Moderate where slopes are 8 to 15 percent.	Moderate where slopes are 5 to 6 percent. Severe where slopes are 6 to 15 percent.	Slight	Slope	Slope	Slope	Moderate: conductivity.
Moderate: fair resistance to piping and erosion.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate intake rate; slope.	All features favorable.	All features favorable.	Moderate: clay loam.
Moderate: moderate slope, stability, and resistance to erosion.	Slight	Slight	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 3 percent.	Slight	Moderate intake rate; slope.	All features favorable.	All features favorable.	Moderate: silty clay loam below the surface layer.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Severe: flood hazard.	Slight	Moderate intake rate; flood hazard.	Flood hazard	Flood hazard	Low.
Moderate: fair resistance to piping and erosion.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Very high intake rate in surface layer.	High hazard of soil blowing.	High hazard of soil blowing.	Low.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
Cottonwood Mapped only in an undifferentiated unit with the Lutie series.	Poor: surface layer is 5 to 9 inches of silt loam.	Poor: bedrock at a depth of 5 to 9 inches.	Moderate: rippable bedrock at a depth of 5 to 9 inches.	Moderate: rippable bedrock at a depth of 5 to 9 inches.	Severe: bedrock at a depth of 5 to 9 inches.	Severe: bedrock at a depth of 5 to 9 inches.	Severe: bedrock at a depth of 5 to 9 inches.
Delwin: DeB, DfC3	Poor: fine sand surface layer.	Good	Slight	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
Devol: DlB, DlD, DmC3	Poor: loamy fine sand surface layer.	Good	Slight	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Dodson: DoA, DoB	Poor where surface layer is 4 to 8 inches of silt loam. Fair where surface layer is 8 to 16 inches of silt loam. Good where surface layer is 16 to 20 inches of silt loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	Slight	Moderate: moderately slow permeability.
Gageby: Ga	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity.	Moderate: flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Moderate: moderate permeability.	Moderate: moderate permeability.
Grandfield: GdB, GdD, GfA, GfB, GfC, GfC2, GrD3.	Poor where surface layer is loamy fine sand or where it is only 5 to 8 inches of fine sandy loam. Fair where surface layer is 8 to 16 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.

engineering properties of soils—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—			Corrosivity class and soil features for uncoated steel
Farm ponds—Continued Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Severe: bedrock at a depth of 5 to 9 inches.	Slight	Slight	Severe: bedrock at a depth of 5 to 9 inches.	Slight	Nonarable	Nonarable	Nonarable	High: conductivity.
Moderate: fair resistance to piping and erosion.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Very high intake rate in surface layer.	High hazard of soil blowing.	High hazard of soil blowing.	Low.
Moderate: poor resistance to piping and erosion.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate where slopes are 0 to 6 percent; loamy fine sand surface layer. Severe where slopes are 6 to 8 percent.	Moderate: loamy fine sand surface layer.	Very high intake rate in surface layer.	High hazard of soil blowing.	High hazard of soil blowing.	Low.
Moderate: fair resistance to piping and erosion.	Moderate: moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight	Low intake rate.	All features favorable.	All features favorable.	Moderate: silty clay loam below the surface layer.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Moderate: flood hazard.	Moderate: clay loam surface layer.	Flood hazard.	Flood hazard.	Flood hazard.	Moderate: clay loam.
Moderate: fair resistance to piping and erosion.	Slight where surface layer is fine sandy loam. Moderate where surface layer is loamy fine sand.	Slight where surface layer is fine sandy loam. Moderate where surface layer is loamy fine sand.	Slight where surface layer is fine sandy loam and slopes are 0 to 2 percent. Moderate where surface layer is loamy fine sand and slopes are 0 to 5 percent. Severe where slopes are 6 to 8 percent.	Slight where surface layer is fine sandy loam. Moderate where surface layer is loamy fine sand.	Very high intake rate in loamy fine sand surface layer.	High to moderate hazard of soil blowing.	High to moderate hazard of soil blowing.	Moderate: sandy clay loam below the surface layer.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
Guadalupe: Gu	Good	Good	Moderate: flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
*Gypsum outcrop: GyC. No interpretations made for Gypsum outcrop; properties too variable. For the properties of Quinlan soils in GyC, see Quinlan series.							
Hardeman: HaC, HaD	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Likes: LkB	Poor: loamy fine sand surface layer.	Good	Slight	Slight	Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Lincoln: Ln	Poor: loamy fine sand surface layer.	Good	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Severe: rapid permeability.	Severe: rapid permeability.
*Lutie: LuB, LuC, LwB. For properties of Cotonwood soils in LwB, see Cottonwood series.	Fair: surface layer is 11 to 14 inches of silt loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: moderate permeability.
*Mansker: MaB, MaC. For properties of Portales soils in MaB and MaC, see Portales series.	Fair: surface layer is 7 to 14 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
*Mobeetie: MrC, MrD, MsD. For properties of Potter soils in MsD, see Potter series.	Good where slopes are 1 to 8 percent. Fair where slopes are 8 to 16 percent.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; some slopes of 8 to 16 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.

engineering properties of soils—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—			Corrosivity class and soil features for uncoated steel
Farm ponds—Continued Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Moderate: flood hazard.	Slight	Flood hazard	Flood hazard	Flood hazard	Low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Moderate where slopes are 3 to 6 percent. Severe where slopes are 6 to 8 percent.	Slight	Slope	All features favorable.	All features favorable.	Low.
Moderate: poor resistance to piping and erosion.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Nonarable	Nonarable	Nonarable	Low.
Moderate: poor resistance to piping and erosion.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: loamy fine sand surface layer.	Nonarable	Nonarable	Nonarable	Low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 5 percent.	Slight	Slope	All features favorable.	All features favorable.	Moderate: silty clay loam below the surface layer.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 5 percent.	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam below the surface layer.
Moderate: fair resistance to piping and erosion.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 16 percent.	Slight	Slope	All features favorable.	All features favorable.	Low.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
*Obaro: ObC2, OuD For properties of Quinlan soils in OuD, see Quinlan series.	Good where slopes are 3 to 8 percent. Fair where slopes are 8 to 12 percent.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 12 percent.	Severe: bedrock at a depth of 20 to 48 inches.	Severe: bedrock at a depth of 20 to 48 inches.	Moderate: moderate permeability.
Paducah: PaB, PaC	Fair: surface layer is 7 to 12 inches of silt loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Severe where bedrock is at a depth of 36 to 48 inches. Moderate where bedrock is at a depth of 48 to 72 inches.	Severe: where bedrock is at a depth of 36 to 40 inches. Moderate where bedrock is at a depth of 40 to 72 inches.	Moderate: moderate permeability.
Portales Mapped only in an undifferentiated unit with the Mansker series.	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
*Potter: PoB, PrE For properties of Berda soils in PrE, see Berda series.	Poor where surface layer has 15 to 30 percent coarse fragments and is 4 to 8 inches of loam. Fair where surface layer has 3 to 15 percent coarse fragments and is 8 to 12 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Severe: seepage.	Severe: seepage.
Pratt: PtB	Poor: fine sand surface layer.	Good	Slight	Slight	Slight	Severe: rapid permeability.	Severe: rapid permeability.
Pullman: PuA	Fair: surface layer is 6 to 12 inches of silty clay loam.	Poor: high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: very slow permeability.	Slight	Slight

engineering properties of soils—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—			Corrosivity class and soil features for uncoated steel
Farm ponds—Continued Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Moderate: fair resistance to piping and erosion.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 12 percent.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent.	Slight	Slope	All features favorable.	All features favorable.	Low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 5 percent.	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam below surface layer.
Moderate: fair resistance to piping and erosion.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: slopes of 2 to 5 percent; clay loam surface layer.	Moderate: clay loam surface layer.	Slope	All features favorable.	All features favorable.	Moderate: clay loam to sandy clay loam.
Severe: 4 to 12 inches of material.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 16 percent.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 16 percent.	Slight	Nonarable	Nonarable	Nonarable	Moderate: conductivity.
Moderate: poor resistance to erosion.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Nonarable	Nonarable	Nonarable	Low.
Moderate: fair resistance to piping and erosion.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Very slow permeability.	All features favorable.	All features favorable.	High: clay below surface layer.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
Quinlan ..... Mapped only in undifferentiated units with Gypsum outcrop and Obaro series.	Fair where the upper 10 to 16 inches is silt loam. Good where the upper 16 to 20 inches is silt loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: moderately rapid permeability.
Rough broken land: Ro. No interpretations made; properties too variable.							
Sweetwater: Sw	Poor: poorly drained.	Poor: poorly drained.	Severe: poorly drained.	Severe: poorly drained; flood hazard.	Severe: flood hazard; poorly drained.	Severe: high water table; seepage.	Severe: seepage.
Tipton: TpA, TpB	Fair: surface layer is 6 to 12 inches of loam.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Slight	Moderate: moderate permeability.	Moderate: moderate permeability.
Tivoli: Tv	Poor: fine sand surface layer.	Good.....	Slight.....	Slight.....	Slight.....	Severe: rapid permeabilty.	Severe: rapid permeability.
Veal: VeC	Poor: excess lime.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight.....	Slight	Severe: seepage.	Severe: seepage.

laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7; and A-7-5, A-7-6. If soil material is near a classification boundary, it is given a symbol showing both classes, for example, A-2 or A-4. Within each group, the relative engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest.

In the Unified Soil Classification System, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example CH or MH.

Engineering properties of the soils

Table 4 provides estimates of soil properties important to engineering. The estimates are based on field classification and descriptions, physical and chemi-

engineering properties of soils—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—			Corrosivity class and soil features for uncoated steel
Farm ponds—Continued Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Severe: 10 to 20 inches of material.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent.	Slight	Nonarable	Nonarable	Nonarable	Low.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard; poorly drained.	Severe: flood hazard; poorly drained.	Severe: flood hazard; poorly drained.	Severe: poorly drained.	Nonarable	Nonarable	Nonarable	High: poorly drained.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight where slopes are 0 to 2 percent. Moderate where slopes are 1 to 3 percent.	Slight	Slope	All features favorable.	All features favorable.	Moderate: clay loam below surface layer.
Severe: poor resistance to piping and erosion; poor stability.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Severe: fine sand surface layer.	Nonarable	Nonarable	Nonarable	Low.
Moderate: fair resistance to piping and erosion.	Slight	Slight	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent.	Slight	Slope	All features favorable.	All features favorable.	High: sandy clay loam below surface layer; conductivity.

cal tests of selected representative samples, test data from comparable soils in adjacent areas, and detailed experience in working with the individual kind of soil in the survey area.

Hydrologic soil groups give the runoff potential from rainfall. The soils are classified on the basis of intake of water at the end of long-duration storms occurring after prior wetting and opportunity for swelling, and without the protective effects of vegetation. Four major soil groups are used and are defined in the following paragraphs.

Group A consists of soils that have a high infiltration rate even when thoroughly wetted. These soils consist chiefly of deep, well-drained to excessively drained sands or gravels. Soils in this group have a low runoff potential and a high rate of water transmission in that water readily passes through them.

Group B soils have a moderate infiltration rate when thoroughly wetted. These are chiefly moderately deep to deep, moderately well drained to well drained soils that are moderately fine textured to moderately coarse textured. These soils have a moderate rate of water transmission.

Group C soils have a slow infiltration rate when

thoroughly wetted. These are chiefly soils that have a layer that impedes downward movement of water or soils that are moderately fine textured to fine textured. These soils have a slow rate of water transmission.

Group D soils have a very slow infiltration rate when thoroughly wetted. These are chiefly clay soils that have a high swelling potential, a permanent high water table, and a claypan or clay layer at or near the surface and shallow soils over nearly impervious material. Soils in this group have a high runoff potential and a very slow rate of water transmission.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classifications are defined in the Glossary of this survey.

In the next two columns the Unified and the AASHO classifications are given.

In the column headed "Percentage passing sieve," estimates are given for a range in percentage of soil materials passing four different sieve sizes. This information is useful in helping to determine suitability of the soil as a source of material for construction purposes.

Permeability, as used in table 4, relates only to movement of water downward through undisturbed and uncompacted soil and does not include lateral seepage. The estimates are based on structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from use of the soils are not considered. These ratings should not be confused with the coefficient of permeability "K" used by engineers.

Available water capacity is the amount of water a soil can hold and make available to plants. It is the numerical difference between the percentage of water at field capacity and the percentage of water at the time plants wilt. The rate is expressed in inches of water per inch of soil.

Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The pH value, and relative terms used to describe soil reaction, are explained in the Glossary.

Shrink-swell potential indicates the change in volume that occurs in a soil with changes in moisture content. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates hazards to the maintenance of structures constructed in, on, or with such materials.

Soil salinity data were not included in the table, because salinity is not a concern in any of the soils in Wheeler County.

The depth to the water table under most soils in Wheeler County is many feet. However, Sweetwater soils have a water table at a depth of about 30 inches. In a few places, the Lincoln soils have a water table at a depth of 5 to 10 feet.

Depth to bedrock generally is not a concern in Wheeler County. However, Quinlan soils have weakly cemented sandstone at a depth of 10 to 20 inches, Cottonwood soils have gypsum at a depth of 5 to 9 inches, and Potter soils have platy caliche at a depth of 4 to 12 inches.

Engineering interpretations of the soils

Table 5 contains selected information useful to engineers and others who plan to use soil material in construction of highways, farm facilities, buildings, and sewage disposal systems. Detrimental or undesirable features are emphasized. The ratings and other interpretations in this table are based on estimated engineering properties of the soils in table 4, on available test data, and on field experience. The information applies only to the soil depth indicated in table 4.

Topsoil is fertile soil or soil material, ordinarily rich in organic matter, that is used as a topdressing for lawns, gardens, roadbanks, and the like. The ratings indicate suitability for such use.

Road subgrade is material used to build embankments. The ratings indicate performance of soil material moved from borrow areas for these purposes.

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. The soil features, both favorable and unfavorable, are the principal ones that affect geographic location of highways.

Foundations for low buildings are affected chiefly by features of the undisturbed soil that influence its capacity to support low buildings that have normal foundation loads. Specific values of bearing strength are not assigned.

Septic tank filter fields are affected mainly by permeability, location of water table, and susceptibility to flooding. The degree of limitations and principal reasons for assigning moderate or severe ratings are given.

Sewage lagoons are influenced chiefly by soil features such as permeability, location, water table, and slope. The degree of limitation and principal reasons for assigning moderate or severe ratings are given.

Farm pond reservoir areas are affected mainly by seepage loss of water, and the soil features are those that influence such seepage.

Farm pond embankments serve as dams. The soil features are those of both subsoil and substratum that are important to the use of soils for constructing embankments.

Camp areas are areas suitable for overnight or week-long camping. They need to be on soils that do not require hard surfacing for parking and that have no hard layers to interfere with setting tent pegs. Load-bearing strength of the natural soil as influenced by soil texture and soil moisture are particularly important. Flooding, dust, sandiness, muddiness, slope, and stoniness are other criteria used in rating the soils for camp areas. Grass-covered, tree-shaded grounds are most desirable for campsites.

The ratings for picnic areas assume that automobile traffic will be confined to access roads. Flooding, slope, texture of the surface layer, and amount of coarse fragments on the surface are considered in making the evaluation. The presence of shade trees or lakes may affect the desirability of the site.

Playgrounds are areas developed for intensive play and organized games such as baseball, football, badminton, volleyball, and soccer. They are subject to intensive foot traffic and generally require a soil that

has a nearly level surface, good drainage, and a firm surface free of rock outcrops and stones.

Paths and trails are footpaths, cross-country hiking trails, and bridle paths. The soil features considered in the ratings are those that affect the ease with which people can move about over the soil on foot or horseback as they seek recreation and the opportunity to enjoy the beauties of nature. It is assumed that only enough vegetation is removed to provide a pathway, and that there are few or no excavations or fills along the pathway. Since grass cover cannot be maintained in the pathway, muddiness, dustiness, and sandiness are particularly important soil features considered in the rating. Other important soil features include stony or gravelly surfaces, steep slopes, and flooding. These trafficways should be designed and maintained to minimize erosion.

Irrigation is affected by soil features such as slope, permeability, thickness of the soil, texture of the surface layer, and potential flood hazard. Both sprinkler and surface irrigation systems are used on soils in Wheeler County. Sprinkler irrigation is the most practical on soils that have a gently sloping or undulating surface or a more sandy texture. Surface irrigation is the most practical in nearly level areas of finer textured soils.

Terraces and diversions are structures that slow runoff water to nonerosive velocities, that allow more water to soak into the ground, and that protect areas downslope from damaging runoff. The soil features that affect these structures include texture, stability, thickness of soil for construction, and slope.

Grassed waterways are natural or shaped watercourses, covered with vegetation, that are used to carry off discharge water from terrace systems, diversions, and other areas. Soil features that affect grassed waterways include texture, available water capacity, soil depth, slope, and erosiveness.

Corrosivity refers to those soil properties that affect the corrosion of uncoated steel pipe and concrete. The factors that affect pipe corrosion include drainage, texture, acidity, resistivity, and conductivity. Properties that affect corrosion of concrete include texture and reaction, amount of sodium or magnesium sulphate, or sodium chloride present in the soil. Soils are rated for corrosivity at a depth of 4 feet. All soils in Wheeler County rate low for concrete corrosivity, and a column for corrosivity of concrete was not included on the table.

Sand and gravel have not been located in Wheeler County in significant amounts, and so ratings of the soils as probable sources were not included in table 4. Soft caliche, used locally in roadbeds, underlies the Potter soils, and Tivoli and Lincoln soils are sources of poorly graded sand.

Winter grading is affected chiefly by soil features that are relevant to moving, mixing, and compacting soil in roadbuilding when temperatures are below freezing. Winter grading is not considered a serious problem in Wheeler County, because subfreezing temperatures are generally of relative short duration and the soils generally have a low content of moisture in the winter. Ratings of the soils for winter grading were not included in the table.

Formation and Classification of the Soils

This section discusses the factors of soil formation, the processes of horizon differentiation, and the classification of the soils.

Formation of the Soils

The five major factors of soil formation are climate, living organisms (especially vegetation), parent material, relief, and time. The kind of soil that forms in one area differs from the kind of soil in another area if there has been a difference between the two areas in one or more of the major factors.

Climate

The climate of Wheeler County is subtropical. Winters are dry, and summers are humid. Although the climate is fairly uniform, its effects have been modified locally by relief and runoff. Because rainfall is low and there are long, dry periods, soil development is slow. The soils are seldom wet below the root zone, and, as a result, many have a horizon of calcium carbonate accumulation. Leaching has not removed free lime from the upper layers of Mansker, Mobeetie, or Veal soils.

Living organisms

Plants, micro-organisms, earthworms, and other forms of animal life are important in the formation of soils. The kind and amount of plants are determined partly by the climate and soil. The vegetation in this county is mostly grass, but there are some brushy plants and small hardwood trees.

The prairie type of vegetation contributes large amounts of organic matter to the soil. Grass leaves and stems fall on the surface and then decay and darken the surface of the soil. Roots decompose and distribute organic matter throughout the solum and provide food for earthworms and micro-organisms. Worm casts constitute a large part of the surface layer of some soils. Prairie dogs and other rodents offset the leaching of soluble minerals and destroy soil structure.

Man also has influenced soil formation by fencing the range and allowing it to be overgrazed, by changing the vegetation, and by clearing and plowing the soils for crops. He has clean harvested the crops and has not controlled runoff and soil blowing. Because of these practices, organic matter has been depleted and silt and clay particles have been blown from the plow layer. Heavy machinery and untimely tillage have compacted the soils and have slowed the infiltration of water and air. Irrigation has drastically changed the soil moisture in some areas.

Parent material

Parent material is the unconsolidated mass in which soil forms. It determines the chemical and mineralogical composition of the soil. The parent material of the soils of Wheeler County is of mixed origin.

The soils of the Rolling Plains formed in four different kinds of parent material: old alluvial or eolian deposits, siltstone and packsand from the Permian red beds, recent deposits of alluvium, and wind-laid sand.

Grandfield and Abilene soils are among those that formed in a fairly thick mantle of old alluvial outwash. These soils are in large areas throughout the county. Quinlan, Obaro, and Paducah soils are examples of soils that formed in siltstone and sandstone of the Permian red beds. Gageby, Clairemont, and Guadalupe soils, which are on the flood plains of the major creeks, are examples of soils that formed in recent alluvium. Tivoli and Pratt soils are examples of soils that formed in wind-laid sand.

The soils of the High Plains and soils associated with the High Plains formed in loamy eolian sediment.

Relief

Relief influences soil formation through its effects on drainage and runoff. Soil characteristics are influenced by the position of the landscape. Soils that formed in low, concave, or flat areas, such as Abilene, Altus, Bippus, Gageby, Pullman, and Tipton soils, are darker to a greater depth than soils that formed in more sloping areas, such as Berda, Hardeman, Mobeetie, Potter, and Quinlan soils. Soils in low, flat, or concave areas receive extra water, have less runoff, are subject to less erosion, produce more residue, and support more biological activity. In addition, the formation of soils on steep slopes is retarded by continuous erosion.

Time

A long time is generally required for the formation of well-defined, genetically related horizons. Delwin and Pullman soils are examples of soils that have been in place a long time and have well-defined horizons. Examples of young soils that have weakly defined profiles are Clairemont soils on flood plains and Mobeetie soils on foot slopes below the caprock escarpment.

Processes of Horizon Differentiation

The processes involved in the formation of soil horizons in Wheeler County are (1) accumulation of organic matter, (2) leaching of calcium carbonates and bases, and (3) formation and translocation of silicate clay minerals. More than one of these processes has been active in most soils.

The accumulation of organic matter in the upper part of the profile has been important in the formation of an A1 horizon. The soils of Wheeler County are generally low in content of organic matter because the organic matter decomposes rapidly.

Nearly all the soils of this county have been leached, to some degree, of carbonates and bases. Some soil scientists agree that the removal of bases precedes the translocation of silicate clay minerals. This leaching has contributed to the formation of horizons. For example, Grandfield soils have been leached of most carbonates and show distinct horizons. In contrast, Berda soils have not been leached and do not show distinct horizons.

The translocation of clay minerals has also contributed to horizon development in Wheeler County. The eluviated A horizon of some soils is lower in clay content than the B horizon, though the B horizon has an accumulation of clay in pores and on ped surfaces. In the soils of this county, leaching of carbonates and soluble salts and the translocation of silicate clays are among the more important processes in horizon differentiation. Grandfield soils are examples of those in which silicate clays have accumulated in the B horizon.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should refer to the latest literature available.[8, 9]

The current system of classification has six categories. Beginning with broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 6, the soil series of Wheeler County are placed in some of the categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

Order.—Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this, the Entisols and Histosols, occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

Suborder.—Each order is divided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the order. The soil properties used to

[8] SIMONSON, ROY W. SOIL CLASSIFICATION IN THE UNITED STATES. Science 137: 1027–1304, illus. 1962.

[9] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. 1960. [Supplements issued in March 1967, September 1968, and April 1969]

TABLE 6.—*Classification of soil series by higher categories*

Series	Family	Subgroup	Order
Abilene	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Altus	Fine-loamy, mixed, thermic	Pachic Argiustolls	Mollisols.
Berda, dark surface variant	Fine-loamy, mixed, thermic	Aridic Haplustolls	Mollisols.
Berda	Fine-loamy, mixed, thermic	Aridic Ustochrepts	Inceptisols.
Bippus	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Carey	Fine-silty, mixed, thermic	Typic Argiustolls	Mollisols.
Clairemont	Fine-silty, mixed (calcareous), thermic	Typic Ustifluvents	Entisols.
Cobb	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Cottonwood	Loamy, mixed (calcareous), thermic, shallow	Ustic Torriorthents	Entisols.
Delwin	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Devol	Coarse-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Dodson	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Gageby	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Grandfield	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Guadalupe	Coarse-loamy, mixed, thermic	Fluventic Ustochrepts	Inceptisols.
Hardeman	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Likes	Mixed, thermic	Typic Ustipsamments	Entisols.
Lincoln	Sandy, mixed, thermic	Typic Ustifluvents	Entisols.
Lutie	Fine-silty, mixed, thermic	Calciorthidic Paleustolls	Mollisols.
Mansker	Fine-loamy, mixed, thermic	Aridic Calciustolls	Mollisols.
Mobeetie	Coarse-loamy, mixed, thermic	Aridic Ustochrepts	Inceptisols.
Obaro	Fine-silty, mixed, thermic	Typic Ustochrepts	Inceptisols.
Paducah	Fine-silty, mixed, thermic	Typic Haplustalfs	Alfisols.
Portales	Fine-loamy, mixed, thermic	Aridic Calciustolls	Mollisols.
Potter	Loamy, carbonatic, thermic, shallow	Ustollic Calciorthids	Aridisols.
Pratt [1]	Sandy, mixed, thermic	Psammentic Haplustalfs	Alfisols.
Pullman	Fine, mixed, thermic	Torrertic Paleustolls	Mollisols.
Quinlan	Loamy, mixed, thermic, shallow	Typic Ustochrepts	Inceptisols.
Sweetwater [1]	Fine-loamy over sandy, or sandy-skeletal, mixed (calcareous), thermic.	Fluvaquentic Haplaquolls	Mollisols.
Tipton	Fine-loamy, mixed, thermic	Pachic Argiustolls	Mollisols.
Tivoli	Mixed, thermic	Typic Ustipsamments	Entisols.
Veal	Fine-loamy, carbonatic, thermic	Aridic Ustochrepts	Inceptisols.

[1] In Wheeler County, the following soils are taxadjuncts to the series for which they are named:
Pratt soils have a thicker A horizon of fine sand and a Bt horizon that has lamellae of sandy loam and thicker bands of sand than are defined for the series. The composite texture is loamy sand.
Sweetwater soils have an A11 horizon that lacks 2 inches of being thick enough for classification as the mollic epipedon defined for the series.
These differences do not alter the use and management of these soils.

separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu*, meaning water or wet, and *ent*, from Entisol).

Great group.—Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and po-

tassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Haplaquents (*Hapl,* meaning simple horizons, *aqu* for wetness or water, and *ent,* from Entisol).

Subgroup.—Great groups are divided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

Family.—Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reactions, soil temperature, permeability, thickness of horizon, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used to differentiate familes (see table 6 on p. 67). An example is the coarse-loamy, siliceous, acid, thermic family of Typic Haplaquents.

General Nature of the County

This section gives some general information about Wheeler County. It also discusses climate and farming in the county.

Wheeler County is in the eastern part of the Panhandle of Texas. The city of Wheeler is the county seat and has a population of about 1,200. Shamrock, located 16 miles south of Wheeler, is the largest town in the county and has a population of about 3,000. The other small towns or communities are Allison, Briscoe, Kelton, Lela, Mobeetie, and Twitty. The city of Wheeler is about 100 miles east of Amarillo and 200 miles north of Abilene. The town of Mobeetie was the first town in the panhandle and was an important trading town for the cattle drives from Texas to Kansas.

Nearly all of Wheeler County is in the Rolling Plains Land Resource Area. It has many, small, spring-fed streams. The North Fork of the Red River is in the southern part of the county.

A Federal highway that runs north and south and a State highway that runs east and west intersect in the town of Wheeler. This Federal highway and an Interstate highway that runs east and west intersect in Shamrock. There are numerous paved farm roads throughout the county. A railroad passes through Allison, Briscoe, and Mobeetie in the northern part of the county, and another runs east and west through Shamrock. These railroads connect the county with most of the important markets in the Southwest. Transportation is also provided by bus companies that have regular routes through the county.

The gas and oil industry has steadily grown in the last 20 years and has brought added income to Wheeler County.

Climate[10]

Wheeler County has a subtropical climate characterized by dry winters and humid summers. The average annual rainfall is 23.17 inches, of which four-fifths falls during the warm season, April through October. The climate is characteristically continental, and there is a wide range between low temperatures in winter and high temperatures in summer.

Warm-season rainfall is the result of thunderstorms that occur most often when moisture-laden air from the Gulf of Mexico penetrates the area and is then lifted by cool fronts moving down across the area from the north or northwest. Showers occur most frequently in May, June, and July. Rainfall amounts may vary tremendously from month to month and from year to year. Moist air from the gulf is closed off rather effectively during the colder months by frequent surges of drier polar air; consequently, the period from November through March is relatively dry.

Wintertime precipitation falls mostly as light snow, which often piles up in drifts so that snowmelt is unevenly distributed. In exceptionally wet years, a considerable amount of the total precipitation may come from very heavy downpours that run off rapidly and erode the soil. The year 1941 was the wettest of record for Wheeler County. In that year, the rain gauge at Shamrock caught a total of 9.13 inches of rainfall in May, 5.71 inches in June, 5.07 inches in August, and 9.77 inches in October. The total for the year was 43.45 inches. The years 1945, 1952, and 1956 were exceptionally dry. The Shamrock gauge caught only 13.77 inches of precipitation in 1945, the driest year of record; a total of 14.07 inches fell in 1952, and 14.20 inches fell in 1956.

Wheeler County experiences a wide range of temperatures. Masses of cold air from the north plunge southward across the plains and bring sharp drops in temperature in winter. In spite of occasional low temperatures, winters are mild in comparison to those of the northern Great Plains. Freezes occur almost every night, but daytime highs are usually in the mid-fifties.

In an average year, the county receives about 66 percent of the total possible sunshine in winter, 68 percent in spring, 77 percent in summer, and 73 percent in the fall. At noon central standard time, the relative humidity averages 53 percent in January, 43 percent in April, 43 percent in July, and 45 percent in October. Thunderstorms occur on an average of 50 days each year; a few of these storms, particularly the ones late in spring, may be accompanied by violent winds or hailstorms. In an average year, free water (lake) evaporation exceeds precipitation by 46 inches.

The warm season (freeze-free period) averages 208 days, and the average dates of the last occurrence of 32° F. or below in spring and the first occurrence of

[10] By ROBERT B. ORTON, climatologist for Texas, National Weather Service, U.S. Department of Commerce.

32° F. or below in fall are April 7 and November 1, respectively. There is a 20 percent chance of a spring freeze after April 30, and a 20 percent chance of a fall freeze before October 22. Warm spells early in spring are sometimes followed by cold snaps that result in damage to trees, shrubs, and tender vegetation. Additional climatological information is in table 7.

Farming

Dryland farming, irrigation farming, and cattle ranching are important in Wheeler County. About 70 percent of the county is used as range. Cotton, sorghums, and wheat are the major cultivated crops.

Cotton is the major cash crop. Grain sorghum and forage sorghum are important crops on diversified farms, and are fed to cattle. Wheat is grown for grain on most farms, but much of the acreage also is used for winter pasture. A few areas are used for rye and barley.

Irrigation farming started in the 1930's and has increased since 1950. Wells furnish most of the water for irrigation. They furnish water for about 14,000 acres of cropland and pasture, although most wells yield less than 300 gallons per minute. Water for irrigation on the Rolling Plains comes mostly from wells less than 150 feet deep. This supply of ground water is apparently recharged with water from the major creeks and drainageways and has seasonal fluctuations.

Raising beef cattle is a major enterprise. On large ranches the cattle feed mainly on native range, but on most farm-ranch units supplemental feed grains and forage crops are grown. Most ranches and farms have cowherds and sell feeder or replacement calves at weaning time. If surplus feed is available, a few ranchers carry over some calves for marketing later or for sale as stocker cattle.

Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

TABLE 7.—*Precipitation and temperature data for Wheeler County, Texas*

[Shamrock, Texas, elevation 2,345 feet. The symbol< means less than]

Month	Temperature [1]				Precipitation [2]							
						Probability, in percent, of receiving during month—						
	Average daily maximum	Average monthly maximum	Average daily minimum	Average monthly minimum	Average total	Trace or less	0.5 inch or more	1 inch or more	2 inches or more	3 inches or more	4 inches or more	5 inches or more	6 inches or more
	°F	°F	°F	°F	*Inches*								
January	55.1	77	26.2	6	0.67	10	53	30	7	2	<1	<1	<1
February	54.3	74	26.9	13	.92	10	55	30	8	1	<1	<1	<1
March	65.0	86	34.3	15	1.08	10	65	40	15	5	2	<1	<1
April	76.9	90	47.4	32	2.13	1	92	72	40	20	5	2	1
May	82.5	96	53.9	40	4.12	<1	98	93	74	54	41	30	20
June	90.3	102	63.3	51	3.37	<1	92	82	60	41	24	15	14
July	96.7	103	69.0	59	2.12	<1	80	66	41	25	15	10	5
August	92.2	104	65.9	56	2.41	1	90	80	52	25	15	8	5
September	84.5	97	58.0	45	2.39	7	75	55	38	24	13	7	5
October	76.4	90	45.6	32	2.20	6	75	75	35	23	14	8	5
November	65.4	82	37.2	21	.89	15	44	25	8	4	2	<1	<1
December	54.5	74	26.0	9	.87	10	53	35	15	7	4	2	<1
Year	74.5		46.2		23.17								

[1] For the period 1964–69.

[2] For the period 1929–69.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Natural soil drainage. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composi-

tion. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body of the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:
Very coarse sand (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Range site management is discussed on page 42 through page 46. Other information is given in tables as follows:

Acreage and extent, table 1, page 8.
Predicted yields, table 2, page 42.
Soil interpretations for wildlife, table 3, page 48.
Engineering uses of the soils, tables 4 and 5, page 50 through page 63.

Map symbol	Mapping unit	Described on page	Capability unit: Dryland Symbol	Dryland Page	Irrigated Symbol	Irrigated Page	Range site: Name
AbA	Abilene clay loam, 0 to 1 percent slopes--	8	IIc-4	36	I-1	39	Deep Hardland
AbB	Abilene clay loam, 1 to 3 percent slopes--	8	IIIe-2	36	IIe-1	40	Deep Hardland
AbC	Abilene clay loam, 3 to 5 percent slopes--	8	IVe-1	37	------	--	Deep Hardland
Af	Altus fine sandy loam----------	10	IIe-3	36	IIe-4	40	Sandy Loam
BeC	Berda loam, dark surface variant, 3 to 5 percent slopes----------	11	IVe-2	37	------	--	Hardland Slopes
BmD	Berda and Mansker soils, 5 to 8 percent slopes----------	10	VIe-2	38	------	--	Hardland Slopes
BpD	Berda and Potter soils, rolling----------	10	------	--	------	--	----------
	Berda soils----------	--	VIe-2	38	------	--	Hardland Slopes
	Potter soils----------	--	VIIs-1	39	------	--	Very Shallow
BrA	Bippus clay loam, 0 to 1 percent slopes---	11	IIc-1	35	I-2	39	Deep Hardland
BrB	Bippus clay loam, 1 to 3 percent slopes---	12	IIIe-2	36	IIe-2	40	Deep Hardland
BrC	Bippus clay loam, 3 to 5 percent slopes---	12	IVe-1	37	------	--	Deep Hardland
Bt	Blown-out land-Tivoli complex----------	12	VIIe-1	39	------	--	----------
	Blown-out land----------	--	------	--	------	--	----------
	Tivoli soils----------	--	------	--	------	--	Deep Sand
CaA	Carey silt loam, 0 to 1 percent slopes----	14	IIc-2	35	I-3	40	Mixedland
CaB	Carey silt loam, 1 to 3 percent slopes----	14	IIe-1	36	IIe-2	40	Mixedland
Cm	Clairemont silt loam----------	14	IIc-3	36	I-3	40	Loamy Bottomland
CoB	Cobb loamy fine sand, loamy substratum, 1 to 3 percent slopes----------	15	IVe-6	38	IIIe-2	40	Sandyland
CoC	Cobb loamy fine sand, loamy substratum, 3 to 5 percent slopes----------	15	VIe-6	39	IVe-2	41	Sandyland
DeB	Delwin fine sand, 0 to 3 percent slopes---	16	IVe-6	38	IIIe-2	40	Sandyland
DfC3	Delwin soils, 2 to 5 percent slopes, severely eroded----------	16	VIe-6	39	------	--	Sandyland
DlB	Devol loamy fine sand, 0 to 3 percent slopes----------	16	IVe-7	38	IVe-3	41	Sandyland
DlD	Devol loamy fine sand, 3 to 8 percent slopes----------	17	VIe-6	39	IVe-3	41	Sandyland
DmC3	Devol soils, undulating, severely eroded--	17	VIe-6	39	------	--	Sandyland
DoA	Dodson silt loam, 0 to 1 percent slopes---	18	IIc-2	35	I-1	39	Deep Hardland
DoB	Dodson silt loam, 1 to 2 percent slopes---	18	IIe-1	36	------	--	Deep Hardland
Ga	Gageby clay loam----------	18	IIc-1	35	I-2	39	Loamy Bottomland
GdB	Grandfield loamy fine sand, 0 to 3 percent slopes----------	19	IVe-6	38	IIIe-2	40	Sandyland
GdD	Grandfield loamy fine sand, 3 to 8 percent slopes----------	19	VIe-6	39	IVe-2	41	Sandyland
GfA	Grandfield fine sandy loam, 0 to 1 percent slopes----------	19	IIe-3	36	IIe-4	40	Sandy Loam
GfB	Grandfield fine sandy loam, 1 to 3 percent slopes----------	19	IIIe-4	37	IIe-3	40	Sandy Loam
GfC	Grandfield fine sandy loam, 3 to 5 percent slopes----------	20	IIIe-4	37	IIIe-3	40	Sandy Loam
GfC2	Grandfield fine sandy loam, 3 to 5 percent slopes, eroded----------	20	IVe-3	37	------	--	Sandy Loam

Map symbol	Mapping unit	Described on page	Capability unit: Dryland Symbol	Dryland Page	Capability unit: Irrigated Symbol	Irrigated Page	Range site: Name
GrD3	Grandfield soils, 3 to 8 percent slopes, severely eroded	20	VIe-6	39	------	--	Sandyland
Gu	Guadalupe fine sandy loam	21	IIe-3	36	I-3	40	Loamy Bottomland
GyC	Gypsum outcrop and Quinlan soils, undulating	21	------	--	------	--	----------
	Gypsum outcrop	--	VIIs-1	39	------	--	Gypland
	Quinlan soils	--	VIe-4	39	------	--	Mixedland
HaC	Hardeman fine sandy loam, 3 to 5 percent slopes	22	IVe-4	37	IIIe-5	41	Sandy Loam
HaD	Hardeman fine sandy loam, 5 to 8 percent slopes	22	VIe-5	39	------	--	Sandy Loam
LkB	Likes loamy fine sand, 1 to 4 percent slopes	22	VIe-6	39	------	--	Sandyland
Ln	Lincoln soils	23	Vw-2	38	------	--	Sandy Bottomland
LuB	Lutie silt loam, 1 to 3 percent slopes	23	IIIe-1	36	IIIe-1	40	Mixedland
LuC	Lutie silt loam, 3 to 5 percent slopes	23	IIIe-3	37	IIIe-4	41	Mixedland
LwB	Lutie and Cottonwood soils, 1 to 4 percent slopes	24	------	--	------	--	----------
	Lutie soils	--	VIe-4	39	------	--	Mixedland
	Cottonwood soils	--	VIIs-1	39	------	--	Gypland
MaB	Mansker and Portales soils, 1 to 3 percent slopes	25	IIIe-1	36	------	--	Hardland Slopes
	Mansker soils	--	------	--	IIIe-1	40	----------
	Portales soils	--	------	--	IIe-2	40	----------
MaC	Mansker and Portales soils, 3 to 5 percent slopes	25	IVe-2	37	IVe-1	41	Hardland Slopes
MrC	Mobeetie fine sandy loam, 1 to 5 percent slopes	26	IVe-4	37	------	--	Sandy Loam
MrD	Mobeetie fine sandy loam, 5 to 8 percent slopes	26	VIe-3	38	------	--	Sandy Loam
MsD	Mobeetie and Potter soils, rolling	26	------	--	------	--	----------
	Mobeetie soils	--	VIe-3	38	------	--	Sandy Loam
	Potter soils	--	VIIs-1	39	------	--	Very Shallow
ObC2	Obaro silt loam, 3 to 5 percent slopes, eroded	27	IVe-2	37	------	--	Mixedland
OuD	Obaro and Quinlan soils, rolling	27	VIe-4	39	------	--	Mixedland
PaB	Paducah silt loam, 1 to 3 percent slopes	28	IIe-1	36	IIe-2	40	Mixedland
PaC	Paducah silt loam, 3 to 5 percent slopes	28	IIIe-3	37	IIIe-4	41	Mixedland
PoB	Potter soils, 1 to 4 percent slopes	29	VIIs-1	39	------	--	Very Shallow
PrE	Potter and Berda soils, 8 to 15 percent slopes	29	------	--	------	--	----------
	Potter soils	--	VIIs-1	39	------	--	Very Shallow
	Berda soils	--	VIe-2	38	------	--	Hardland Slopes
PtB	Pratt fine sand, 1 to 4 percent slopes	30	VIe-1	38	------	--	Deep Sand
PuA	Pullman silty clay loam, 0 to 1 percent slopes	30	IIIe-5	37	IIs-1	40	Deep Hardland
Ro	Roughbroken land	31	VIIs-2	39	------	--	Rough Breaks
Sw	Sweetwater soils	31	Vw-1	38	------	--	Loamy Bottomland
TpA	Tipton loam, 0 to 1 percent slopes	32	IIc-5	36	I-2	39	Deep Hardland
TpB	Tipton loam, 1 to 3 percent slopes	32	IIe-2	36	IIe-2	40	Deep Hardland
Tv	Tivoli fine sand	33	VIIe-1	39	------	--	Deep Sand
VeC	Veal fine sandy loam, 1 to 6 percent slopes	34	IVe-5	38	IVe-1	41	Mixedland Slopes

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program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

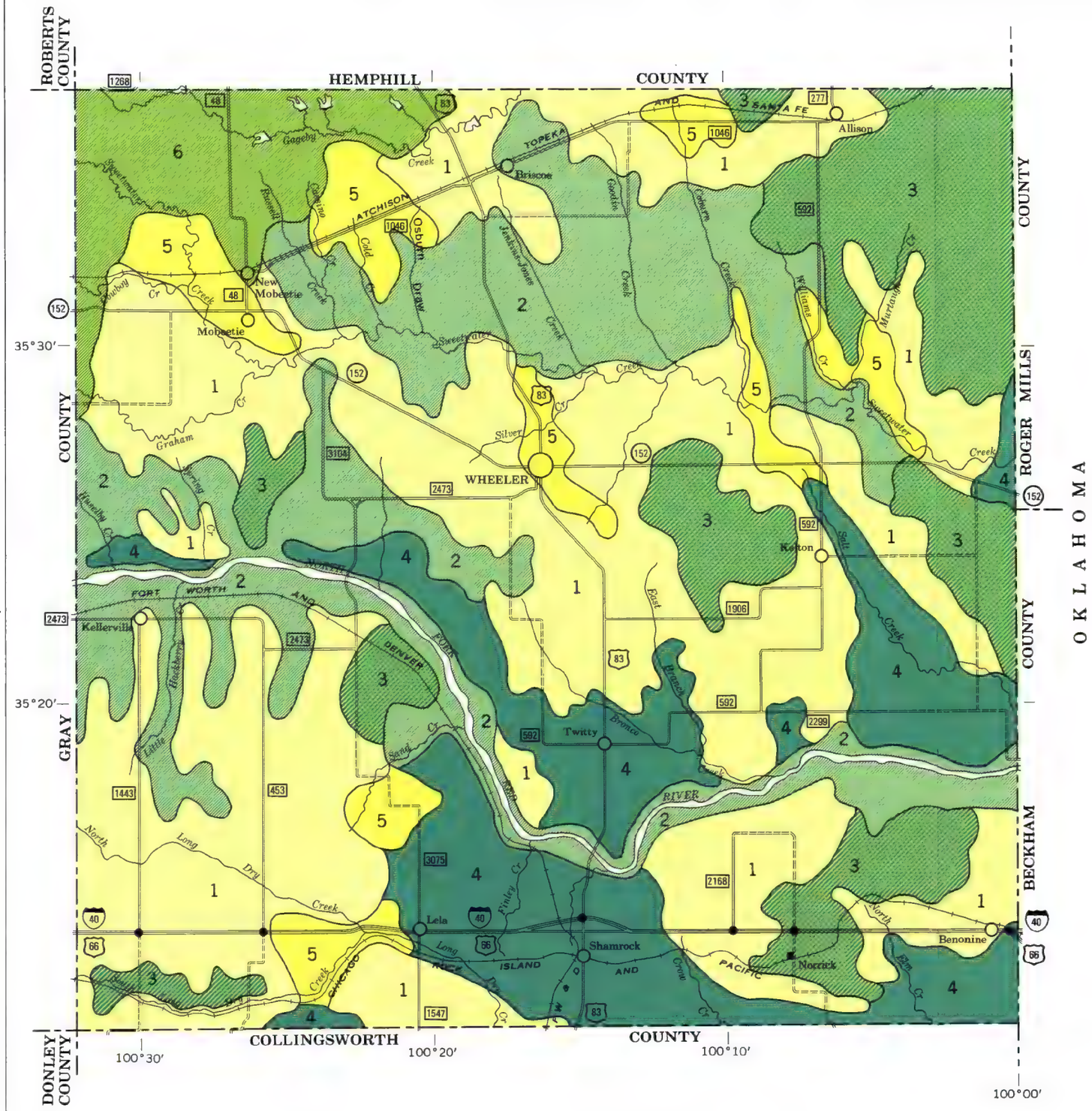
GENERAL SOIL MAP

WHEELER COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

N



SOIL ASSOCIATIONS*

1. Grandfield-Devol association: Deep, nearly level to gently sloping loamy fine sands
2. Devol-Tivoli association: Deep, gently sloping to steep loamy fine sands and fine sands
3. Pratt-Delwin association: Deep, nearly level to gently sloping fine sands
4. Lutie-Obaro-Quinlan association: Deep to shallow, gently sloping and rolling silt loams
5. Grandfield-Hardeman association: Deep, nearly level to sloping fine sandy loams
6. Abilene-Mobeetie-Berda association: Deep, nearly level to sloping and rolling clay loams, loams, and fine sandy loams

*Texture refers to the surface layer of the major soils in each association.

Compiled 1973

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

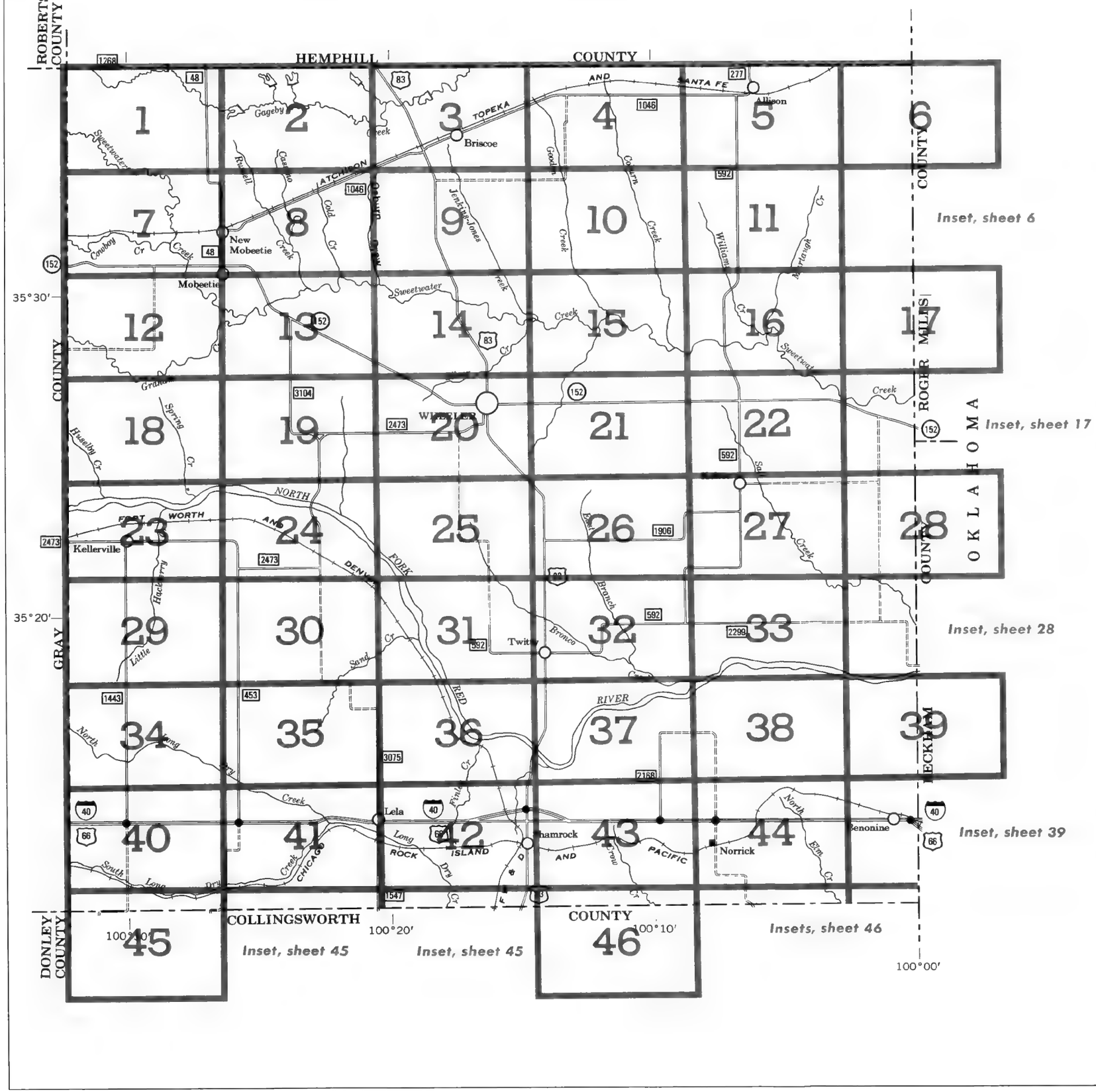
INDEX TO MAP SHEETS

WHEELER COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

N



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Most symbols without a slope letter are those for nearly level soils, but some are for soils and land types that have a considerable range of slope. A final number, 2 or 3, in the symbol shows that the soil is eroded or severely eroded. (W) following the soil name indicates that signs of erosion, especially of local shifting of soil by wind, are evident in some places, but the degree of erosion cannot be estimated reliably.

SYMBOL	NAME
AbA	Abilene clay loam, 0 to 1 percent slopes
AbB	Abilene clay loam, 1 to 3 percent slopes
AbC	Abilene clay loam, 3 to 5 percent slopes
Af	Altus fine sandy loam
BeC	Berda loam, dark surface variant, 3 to 5 percent slopes
BmD	Berda and Mansker soils, 5 to 8 percent slopes
BpD	Berda and Potter soils, rolling *
BrA	Bippus clay loam, 0 to 1 percent slopes
BrB	Bippus clay loam, 1 to 3 percent slopes
BrC	Bippus clay loam, 3 to 5 percent slopes
Bt	Blown-out land-Tivoli complex
CaA	Carey silt loam, 0 to 1 percent slopes
CaB	Carey silt loam, 1 to 3 percent slopes
Cm	Clairemont silt loam
CoB	Cobb loamy fine sand, loamy substratum, 1 to 3 percent slopes
CoC	Cobb loamy fine sand, loamy substratum, 3 to 5 percent slopes
DeB	Delwin fine sand, 0 to 3 percent slopes (W)
DfC3	Delwin soils, 2 to 5 percent slopes, severely eroded
DlB	Devol loamy fine sand, 0 to 3 percent slopes (W)
DlD	Devol loamy fine sand, 3 to 8 percent slopes (W)
DmC3	Devol soils, undulating, severely eroded *
DoA	Dodson silt loam, 0 to 1 percent slopes
DoB	Dodson silt loam, 1 to 2 percent slopes
Ga	Gageby clay loam
GdB	Grandfield loamy fine sand, 0 to 3 percent slopes (W)
GdD	Grandfield loamy fine sand, 3 to 8 percent slopes (W)
GfA	Grandfield fine sandy loam, 0 to 1 percent slopes (W)
GfB	Grandfield fine sandy loam, 1 to 3 percent slopes (W)
GfC	Grandfield fine sandy loam, 3 to 5 percent slopes (W)
GfC2	Grandfield fine sandy loam, 3 to 5 percent slopes, eroded (W)
GrD3	Grandfield soils, 3 to 8 percent slopes, severely eroded
Gu	Guadalupe fine sandy loam
GyC	Gypsum outcrop and Quinlan soils, undulating *
HaC	Hardeman fine sandy loam, 3 to 5 percent slopes
HaD	Hardeman fine sandy loam, 5 to 8 percent slopes
LkB	Likes loamy fine sand, 1 to 4 percent slopes (W)
Ln	Lincoln soils (W)
LuB	Lutie silt loam, 1 to 3 percent slopes
LuC	Lutie silt loam, 3 to 5 percent slopes
LwB	Lutie and Cottonwood soils, 1 to 4 percent slopes
MaB	Mansker and Portales soils, 1 to 3 percent slopes
MaC	Mansker and Portales soils, 3 to 5 percent slopes
MrC	Mobeetie fine sandy loam, 1 to 5 percent slopes
MrD	Mobeetie fine sandy loam, 5 to 8 percent slopes
MsD	Mobeetie and Potter soils, rolling *
ObC2	Obaro silt loam, 3 to 5 percent slopes, eroded
OuD	Obaro and Quinlan soils, rolling *
PaB	Paducah silt loam, 1 to 3 percent slopes
PaC	Paducah silt loam, 3 to 5 percent slopes
PoB	Potter soils, 1 to 4 percent slopes
PrE	Potter and Berda soils, 8 to 15 percent slopes
PtB	Pratt fine sand, 1 to 4 percent slopes (W)
PuA	Pullman silty clay loam, 0 to 1 percent slopes
Ro	Rough broken land
Sw	Sweetwater soils
TpA	Tipton loam, 0 to 1 percent slopes
TpB	Tipton loam, 1 to 3 percent slopes
Tv	Tivoli fine sand (W)
VeC	Veal fine sandy loam, 1 to 6 percent slopes

* The delineations are much larger and the composition of these units is more variable than other map units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Well, irrigation

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

WHEELER COUNTY, TEXAS — SHEET NUMBER 1

WHEELER COUNTY, TEXAS NO. 1

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 290 000 FEET

590 000 FEET

HEMPHILL COUNTY

GRAY COUNTY

Sweetwater Creek

Gageby Creek

MT. ZION CEMETERY

Little Hill

DAM NO 16

1268

48

(Joins sheet 2)

(Joins sheet 7)

2 310 000 FEET

575 000 FEET

N

Scale 1:24 000

2 Miles

10 000 Feet

5 000

(2)

N

2 340 000 FEET

590 000 FEET

HEMPHILL COUNTY

(Joins sheet 3)

2 Miles

10 000 Feet

Scale 1:24 000

(Joins sheet 1)

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

1 5 000

575 000 FEET

2 315 000 FEET

(Joins sheet 8)

DAM NO. 18

DAM NO. 19

DAM NO. 17

DAM NO. 17A

DAM NO. 17B

DAM NO. 20

Gageby Creek

Cassino Creek

Bankhead Mound

Land division corners are approximately positioned on this map.

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WHEELER COUNTY, TEXAS NO. 2

WHEELER COUNTY, TEXAS — SHEET NUMBER 3

WHEELER COUNTY, TEXAS NO. 3

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Land division corners are approximately positioned on this map.

2 345 000 FEET

1 590 000 FEET

HEMPHILL COUNTY

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 9)

2 370 000 FEET

575 000 FEET

Gageby

Lake Fenstermald

DAM No. 21

Creek

SANTA FE

ATCHISON TOPEKA AND

1046

83

3

N

2 Miles

10 000 Feet

Scale 1:24 000

5 000 0 1 000 2 000 3 000 4 000 5 000

(4)

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 1 000 2 000 3 000 4 000 5 000

2 400 000 FEET

590 000 FEET

575 000 FEET

2 375 000 FEET

HEMPHILL COUNTY

ZYBACH CEMETERY

TOPEKA AND SANTA FE ATCHISON

Goodin Creek

1046

(Joins sheet 3)

(Joins sheet 5)

(Joins sheet 10)

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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WHEELER COUNTY, TEXAS NO. 4

WHEELER COUNTY, TEXAS — SHEET NUMBER 5

WHEELER COUNTY, TEXAS NO. 5

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Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 11)

2 405 000 FEET

590 000 FEET

575 000 FEET

2 430 000 FEET

HEMPHILL COUNTY

ATCHISON, TOPEKA AND SANTA FE

Allison

Mulberry Draw

5

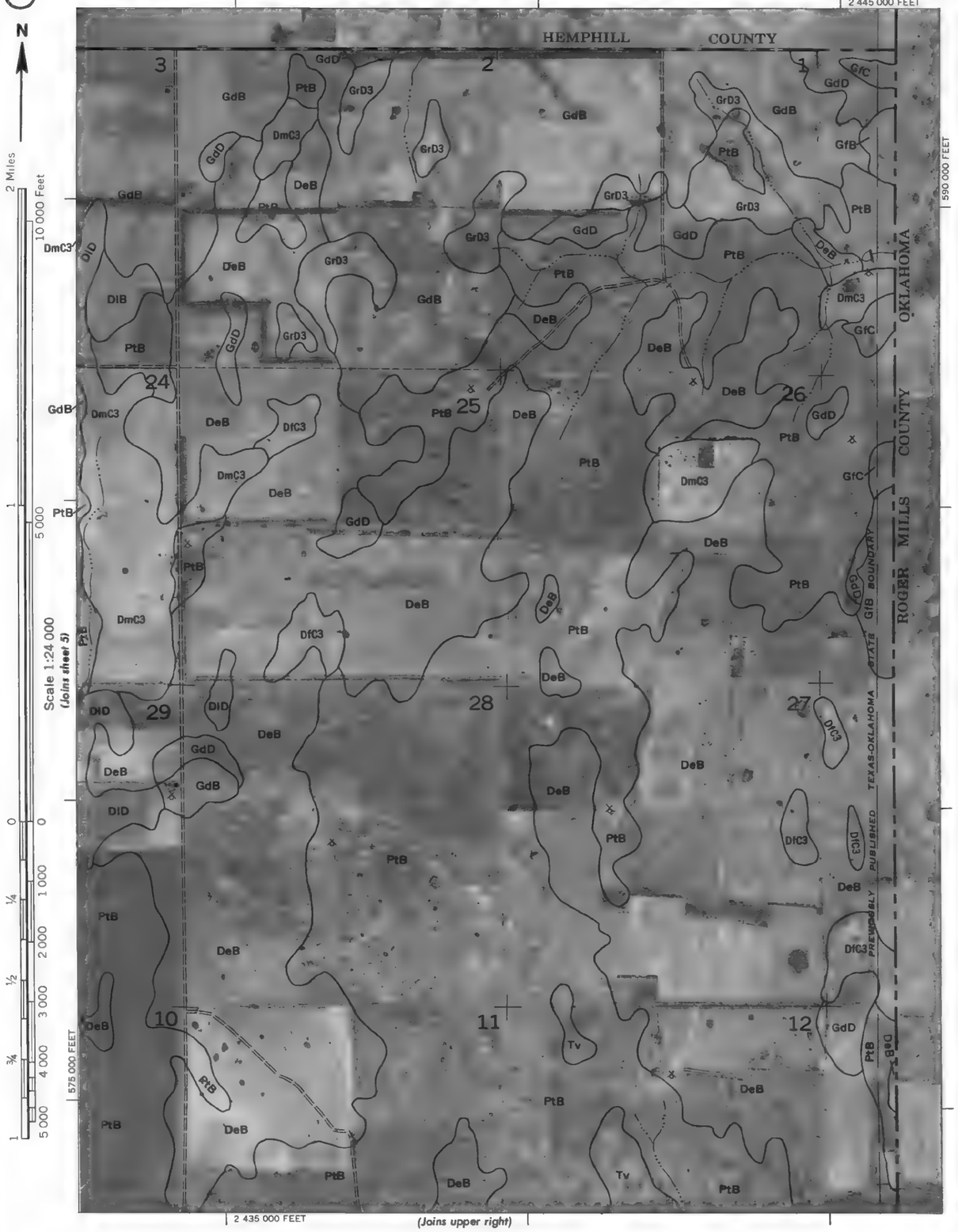
N

2 Miles

10 000 Feet

5 000

Scale 1:24 000



Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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WHEELER COUNTY, TEXAS NO. 6

WHEELER COUNTY, TEXAS — SHEET NUMBER 7

WHEELER COUNTY, TEXAS NO. 7

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Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 290 000 FEET

570 000 FEET

(Joins sheet 11)

(Joins sheet 8)

(Joins sheet 12)

555 000 FEET

2 315 000 FEET

7

N

Scale 1:24 000

2 Miles

10 000 Feet

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

WHEELER COUNTY, TEXAS — SHEET NUMBER 8

(8)

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

0 0

5 000 FEET

(Joins sheet 2)

(Joins sheet 7)

(Joins sheet 13)

(Joins sheet 9)

2 340 000 FEET

2 315 000 FEET

570 000 FEET

555 000 FEET

SANTA FE

ATCHISON TOPEKA

Cassino Creek

Russell Creek

Cold Draw

Osburn Draw

Valley Springs Lakes

New Mobeetie

Mobeetie

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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WHEELER COUNTY, TEXAS NO. 8

WHEELER COUNTY, TEXAS — SHEET NUMBER 9

WHEELER COUNTY, TEXAS NO. 9

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Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 345 000 FEET

2 570 000 FEET

555 000 FEET

2 370 000 FEET

(Joins sheet 3)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 14)

Dubbs Creek

Jenkins Draw

Scale 1:24 000

2 Miles

10 000 Feet

5 000

9

N

WHEELER COUNTY, TEXAS — SHEET NUMBER 10

(10)

N

(Joins sheet 4)

2 400 000 FEET

570 000 FEET

(Joins sheet 9)

(Joins sheet 11)

2 375 000 FEET

(Joins sheet 15)

Scale 1:24 000

2 Miles 1

10 000 Feet 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

555 000 FEET

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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WHEELER COUNTY, TEXAS NO. 10

WHEELER COUNTY, TEXAS — SHEET NUMBER 11

WHEELER COUNTY, TEXAS NO. 11

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Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 405 000 FEET

570 000 FEET

555 000 FEET

2 430 000 FEET

(Joins sheet 10)

(Joins sheet 5)

(Joins sheet 16)

(Joins inset, sheet 6)

11

N

Scale 1:24 000

2 Miles

10 000 Feet

5 000

1

Williams Creek

Frye Lakes

Murtaugh Creek

(12)

WHEELER COUNTY, TEXAS — SHEET NUMBER 12

N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000

1/4 1 000

1/2 2 000

3/4 4 000

1 5 000

0 0

(Joins sheet 7)

(Joins sheet 18)

(Joins sheet 13)

2 315 000 FEET

550 000 FEET

535 000 FEET

2 290 000 FEET

COUNTY

GRAY

Sweetwater

Mobeetie

Graham

Creek

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 12

WHEELER COUNTY, TEXAS — SHEET NUMBER 13

WHEELER COUNTY, TEXAS NO. 13

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Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone
Land division corners are approximately positioned on this map

(Joins sheet 12)

(Joins sheet 8)

(Joins sheet 14)

(Joins sheet 19)

2 315 000 FEET

2 340 000 FEET

1 550 000 FEET

535 000 FEET

13

N

Scale 1:24 000

2 Miles

10000 Feet

5000

1

1 000

2 000

3 000

4 000

5 000

¼

½

¾

0

Mobeetie

MOBEETIE CEMETERY

Adobe Creek

Russell Creek

Sweetwater Creek

Graham Creek

Creek

152

304

BPD

(14)

N

2 Miles

10 000 Feet

1

5 000

Scale 1:24 000

0 0

1/4 1 000

1/2 2 000 3 000

3/4 4 000

1 5 000

2 370 000 FEET

550 000 FEET

535 000 FEET

2 345 000 FEET

(Joins sheet 9)

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 20)

Sweetwater Creek

Dubbs Creek

Crains-Jones Creek

Silver Creek

Sections: 32, 33, 34, 35, 36, 29, 28, 27, 26, 25, 12, 13, 14, 15, 16

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

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WHEELER COUNTY, TEXAS NO. 14

WHEELER COUNTY, TEXAS — SHEET NUMBER 15

WHEELER COUNTY, TEXAS NO. 15

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Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map

2 375 000 FEET

550 000 FEET

535 000 FEET

2 400 000 FEET

(Joins sheet 14)

(Joins sheet 10)

(Joins sheet 16)

(Joins sheet 21)

15

N

Scale 1:24 000

2 Miles

10 000 Feet

5 000

1

0

1 000

2 000

3 000

4 000

5 000

¼

½

¾

16

WHEELER COUNTY, TEXAS — SHEET NUMBER 16

(Joins sheet 11)

2 430 000 FEET

550 000 FEET

535 000 FEET

2 405 000 FEET

OuD MrC (Joins sheet 22)

(Joins sheet 17)

N

Scale 1:24 000 (Joins sheet 15)

2 Miles 1 0 10 000 Feet 5 000 0

¼ 0 1 000

½ 2 000 3 000

¾ 4 000 5 000

1 5 000

Land division corners are approximately positioned on this map

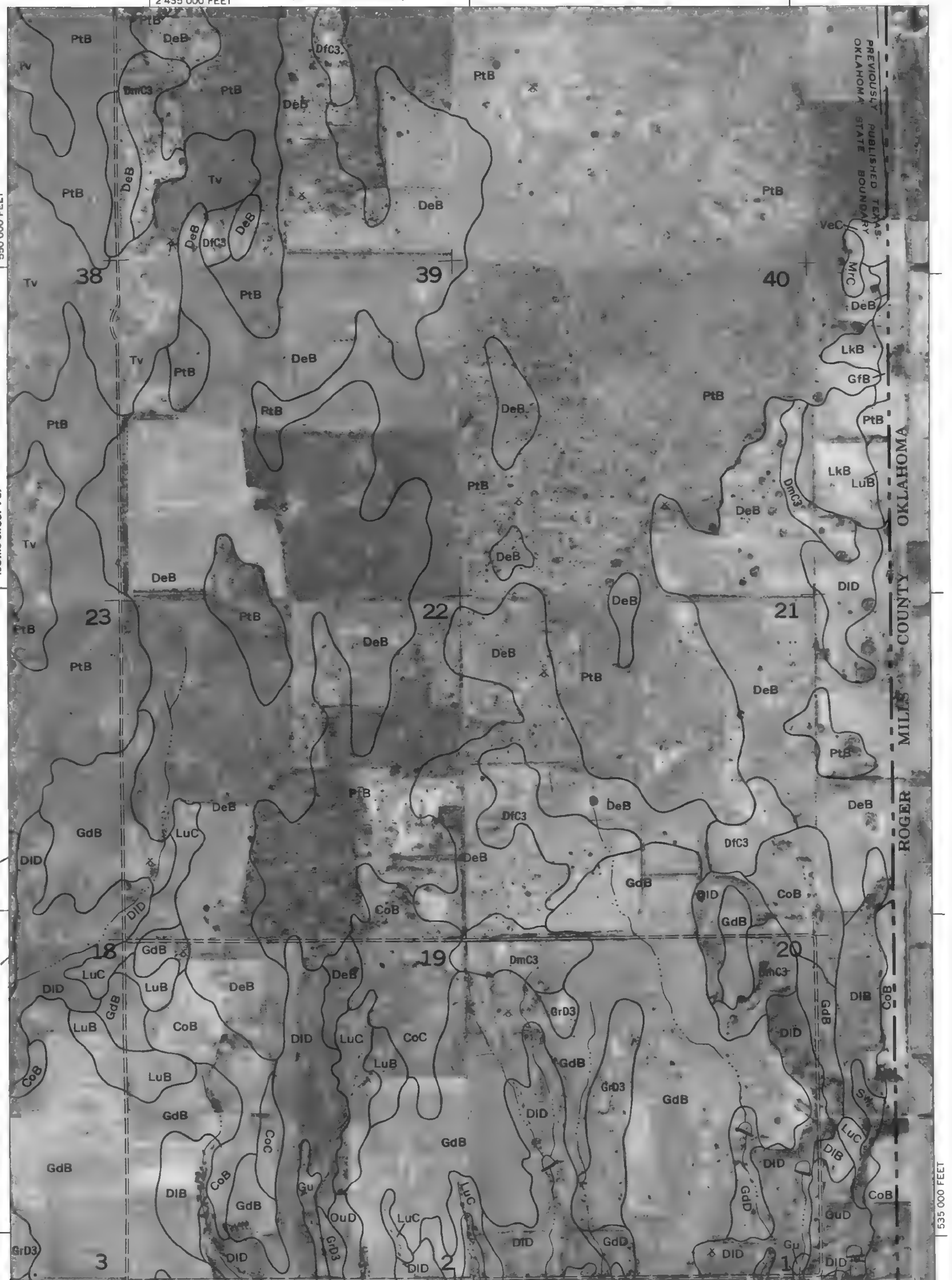
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

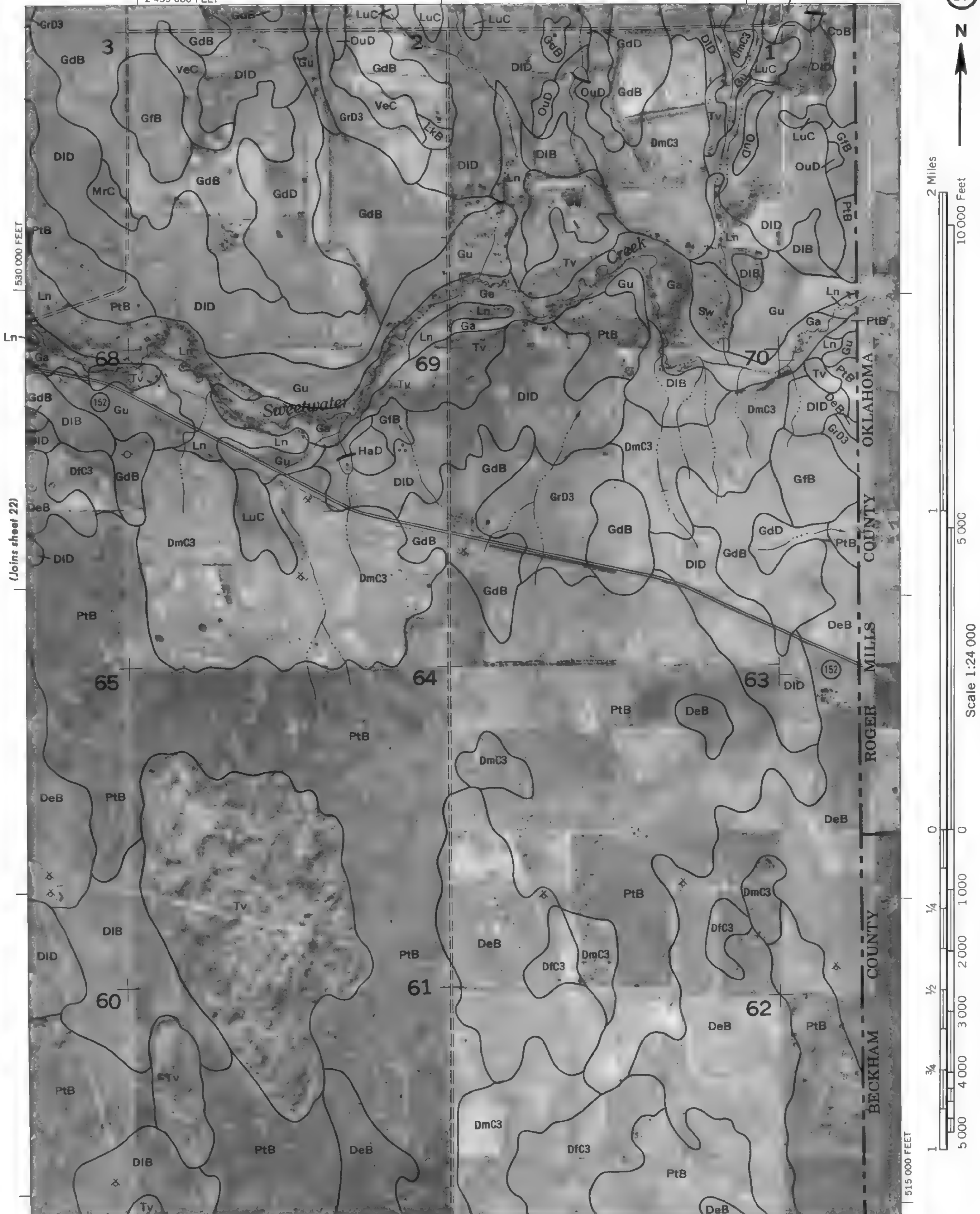
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station

WHEELER COUNTY, TEXAS NO. 16

WHEELER COUNTY, TEXAS NO. 17

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone. Land division corners are approximately positioned on this map.





(Joins sheet 12)

2 315 000 FEET

530 000 FEET

N

2 Miles

10 000 Feet

Scale 1:24 000

5 000

0

1 000

2 000

3 000

4 000

5 000

515 000 FEET

GRAY COUNTY

Creek

Spring

Creek

(Joins sheet 23)

2 290 000 FEET

(Joins sheet 19)

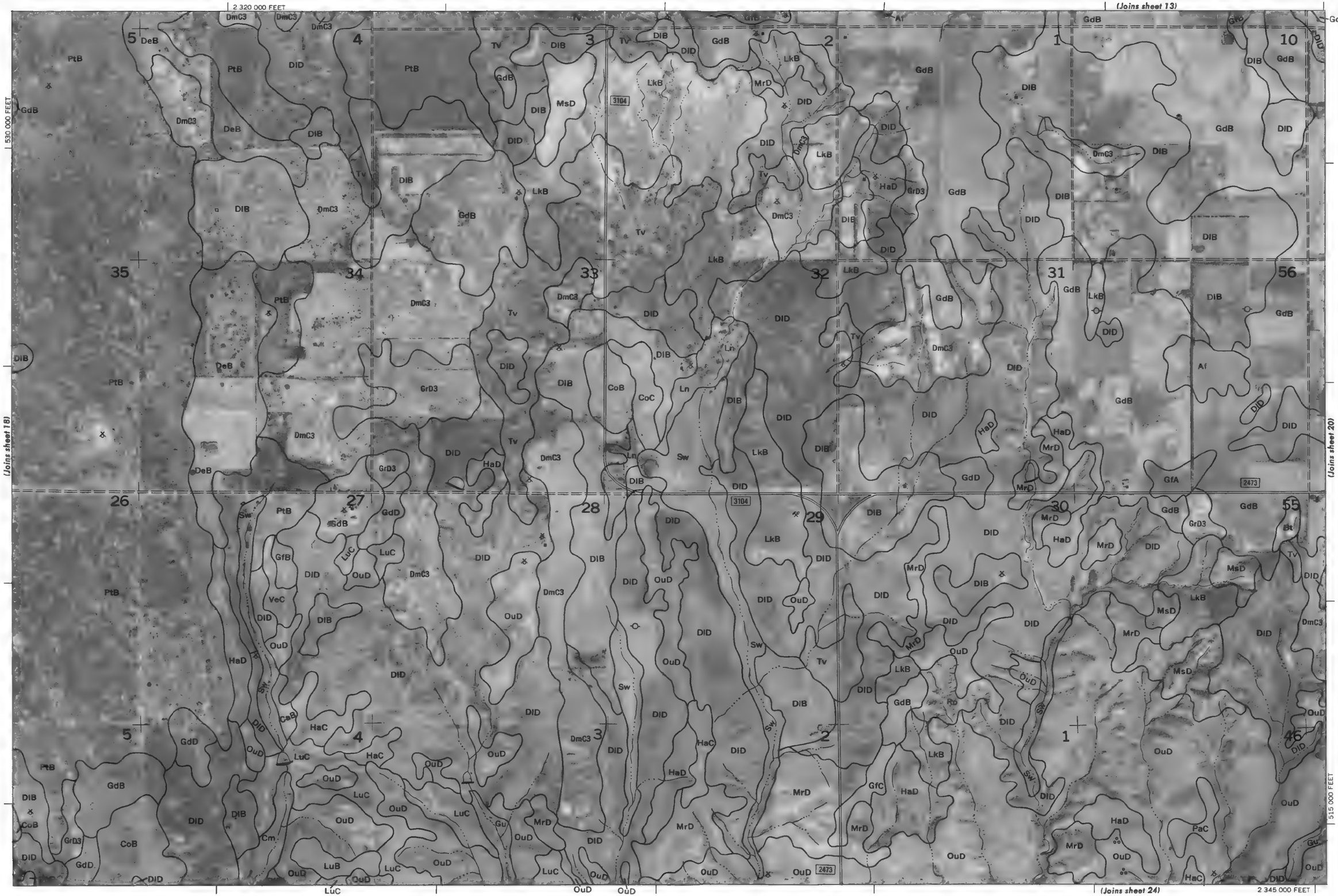
Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 18

WHEELER COUNTY, TEXAS — SHEET NUMBER 19



WHEELER COUNTY, TEXAS NO. 19

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

WHEELER COUNTY, TEXAS — SHEET NUMBER 20

(20)

N

Scale 1:24 000

2 Miles 1 0 10 000 Feet 5 000 0

¼ 1 000 ½ 2 000 ¾ 3 000 1 4 000 5 000

(Joins sheet 14) (Joins sheet 19) (Joins sheet 21) (Joins sheet 25)

2 345 000 FEET 515 000 FEET 530 000 FEET 2 370 000 FEET

WHEELER (county seat)

HOLT AIRFIELD

Court House

Hospital

Silver Creek

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 20

WHEELER COUNTY, TEXAS — SHEET NUMBER 21

WHEELER COUNTY, TEXAS NO. 21

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 375 000 FEET

530 000 FEET

(Joins sheet 20)

(Joins sheet 15)

(Joins sheet 22)

(Joins sheet 26)

2 400 000 FEET

515 000 FEET

21

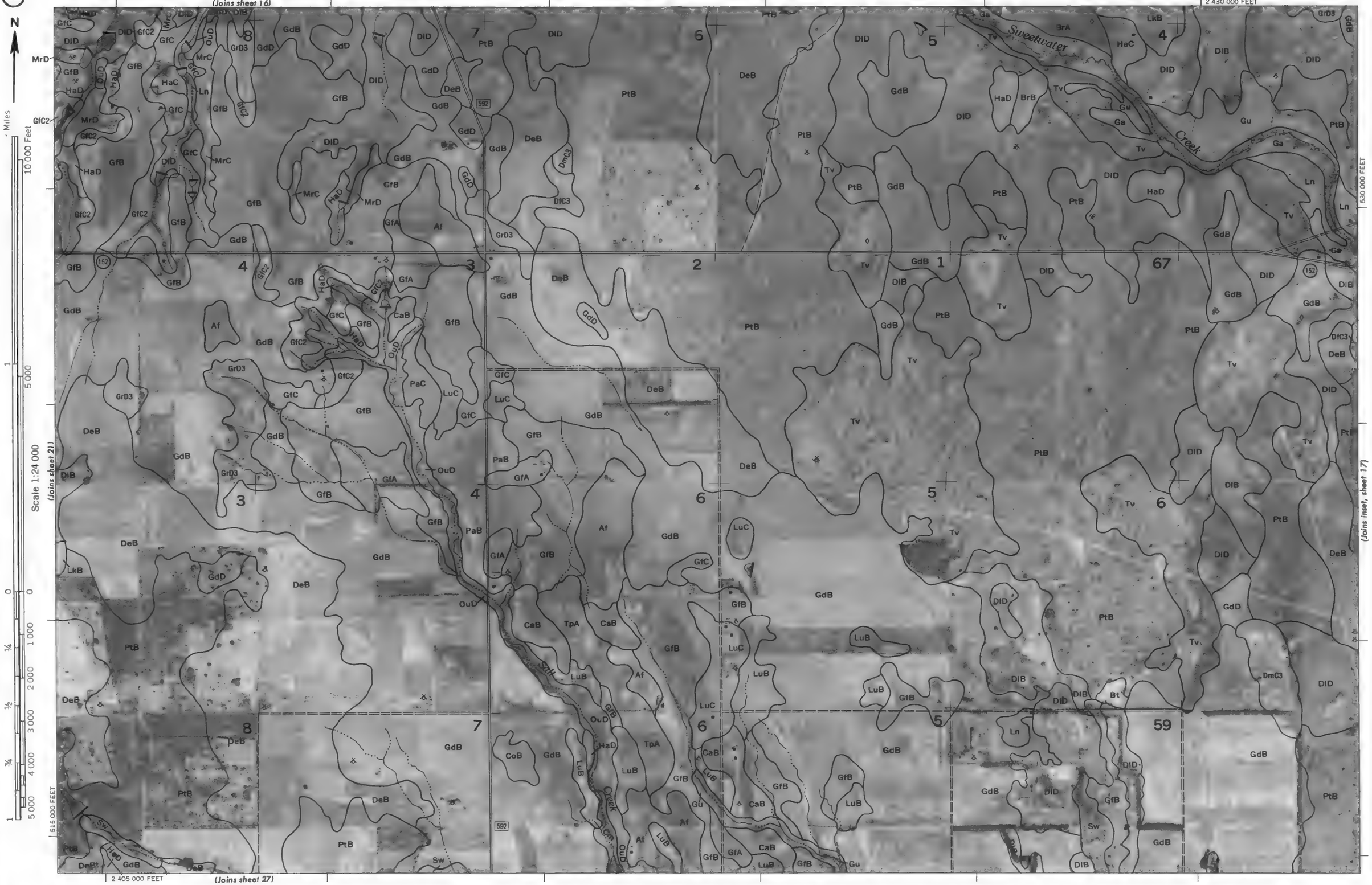
N

2 Miles

10 000 Feet

5 000

Scale 1:24 000

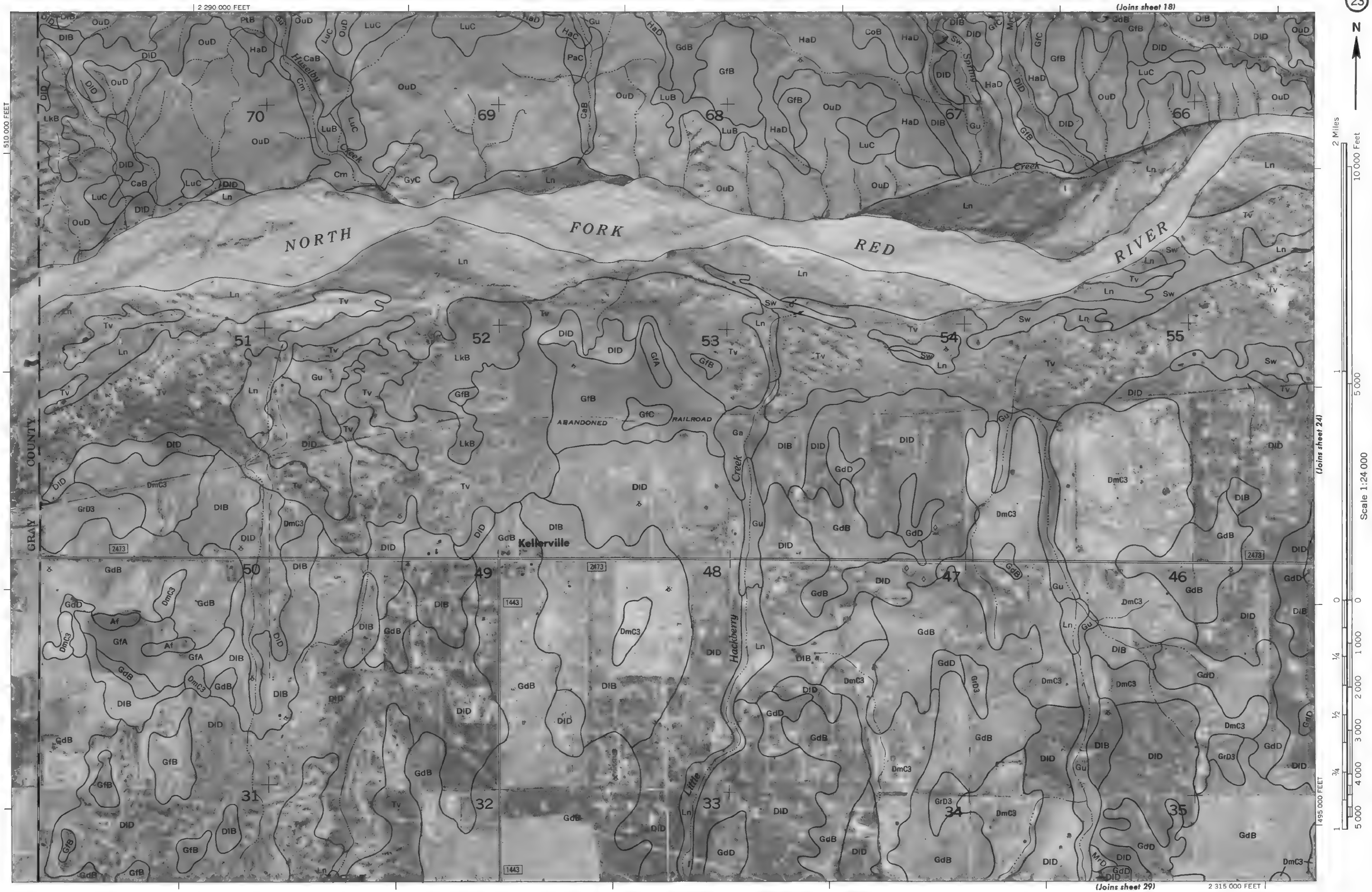


Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 22

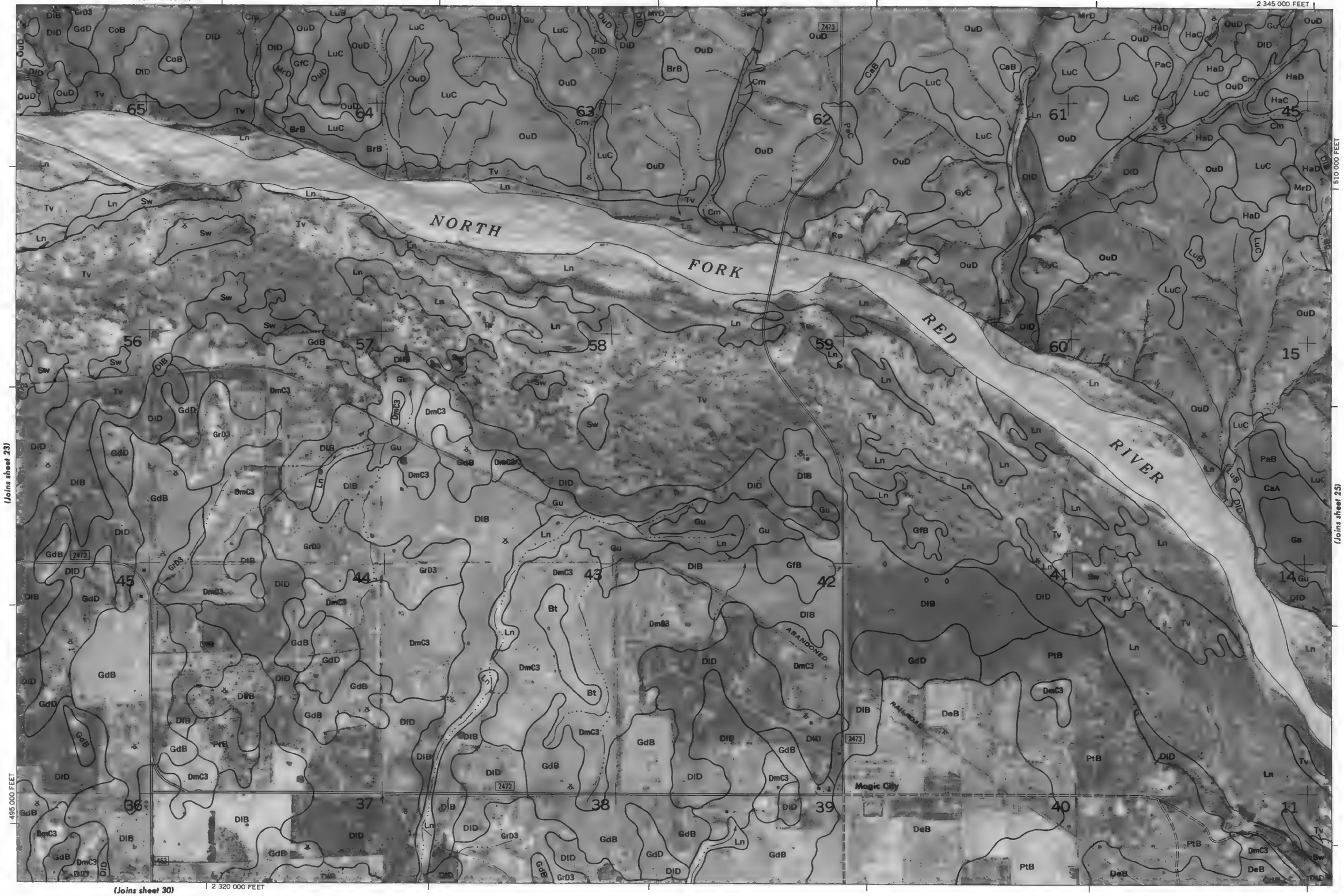


WHEELER COUNTY, TEXAS NO. 23

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

WHEELER COUNTY, TEXAS — SHEET NUMBER 24

(Joins sheet 19)



(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 30)

2 320 000 FEET

495 000 FEET

Scale 1:24 000

2 Miles 1 0 10 000 Feet

1 5 000 0 5 000

¾ 4 000 ½ 3 000 ¼ 2 000 0 1 000

N

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

TEXAS NO. 24

WHEELER COUNTY, TEXAS

WHEELER COUNTY, TEXAS — SHEET NUMBER 25

WHEELER COUNTY, TEXAS NO. 25

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 345 000 FEET

510 000 FEET

(Joins sheet 24)

(Joins sheet 20)

(Joins sheet 26)

(Joins sheet 31)

495 000 FEET

2 375 000 FEET

25

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 1 000 2 000 3 000 4 000 5 000

NORTH FORK RED RIVER

Tm Bronco Creek

WHEELER COUNTY, TEXAS — SHEET NUMBER 26

(Joins sheet 21)

2 400 000 FEET

N

2 Miles

10 000 Feet

1

5 000

Scale 1:24 000

(Joins sheet 25)

0 0 1 000 2 000 3 000 4 000 5 000 FEET

1/4 1/2 3/4 1

495 000 FEET

510 000 FEET

(Joins sheet 27)

2 375 000 FEET

(Joins sheet 32)

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 26

WHEELER COUNTY, TEXAS — SHEET NUMBER 27

27

N

WHEELER COUNTY, TEXAS NO. 27

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 405 000 FEET

510 000 FEET

(Joins sheet 22)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 33)

2 430 000 FEET

Kelton

KELTON CEMETERY

Salt Creek

Scale 1:24 000

2 Miles 1 0 1

10 000 Feet 5 000 0 5 000

½ 0 ½

¼ 0 1 000 2 000 3 000 4 000

¾ 0 ¾

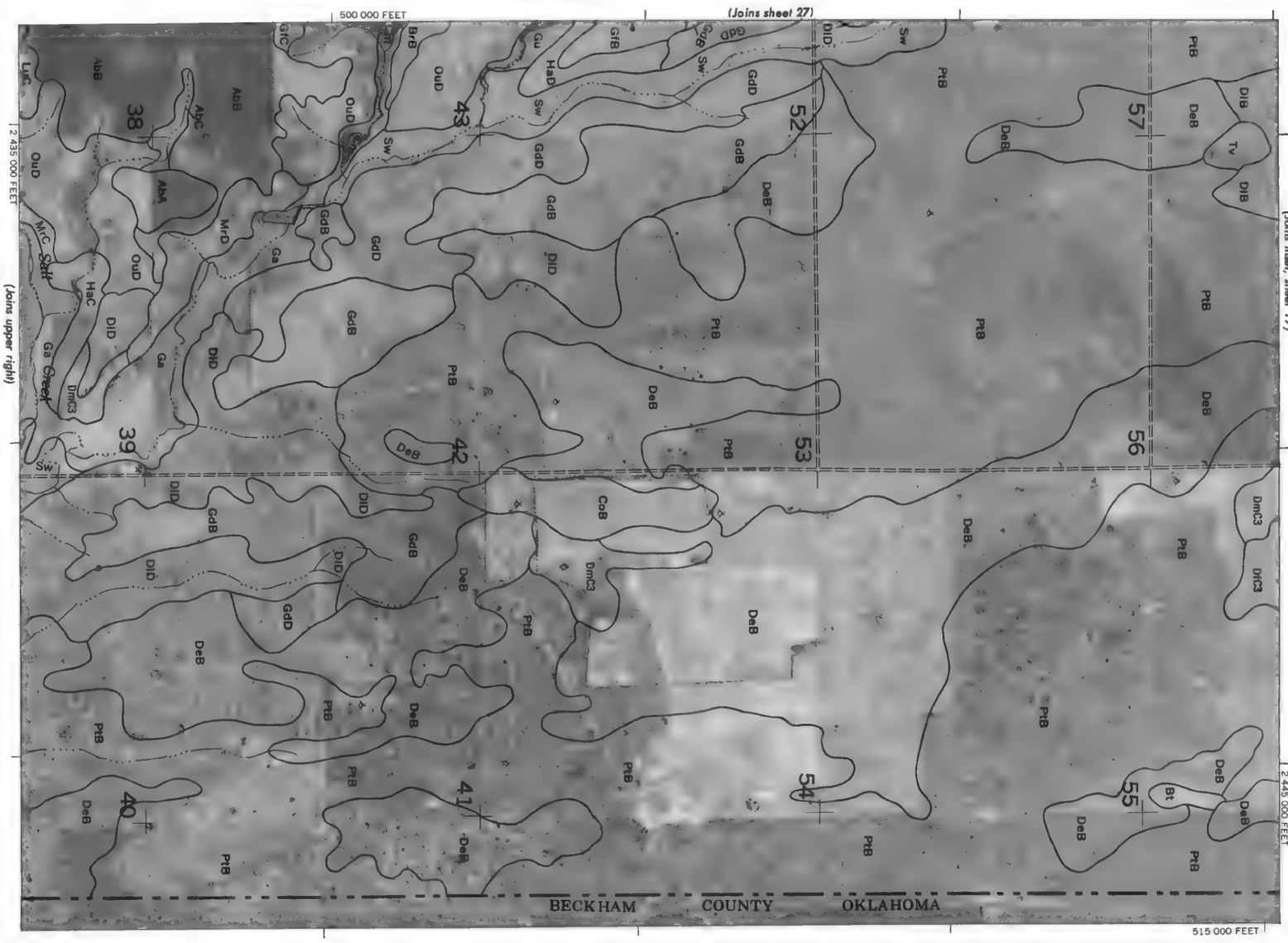
1 ¾ ½ ¼ 0 1 2 Miles

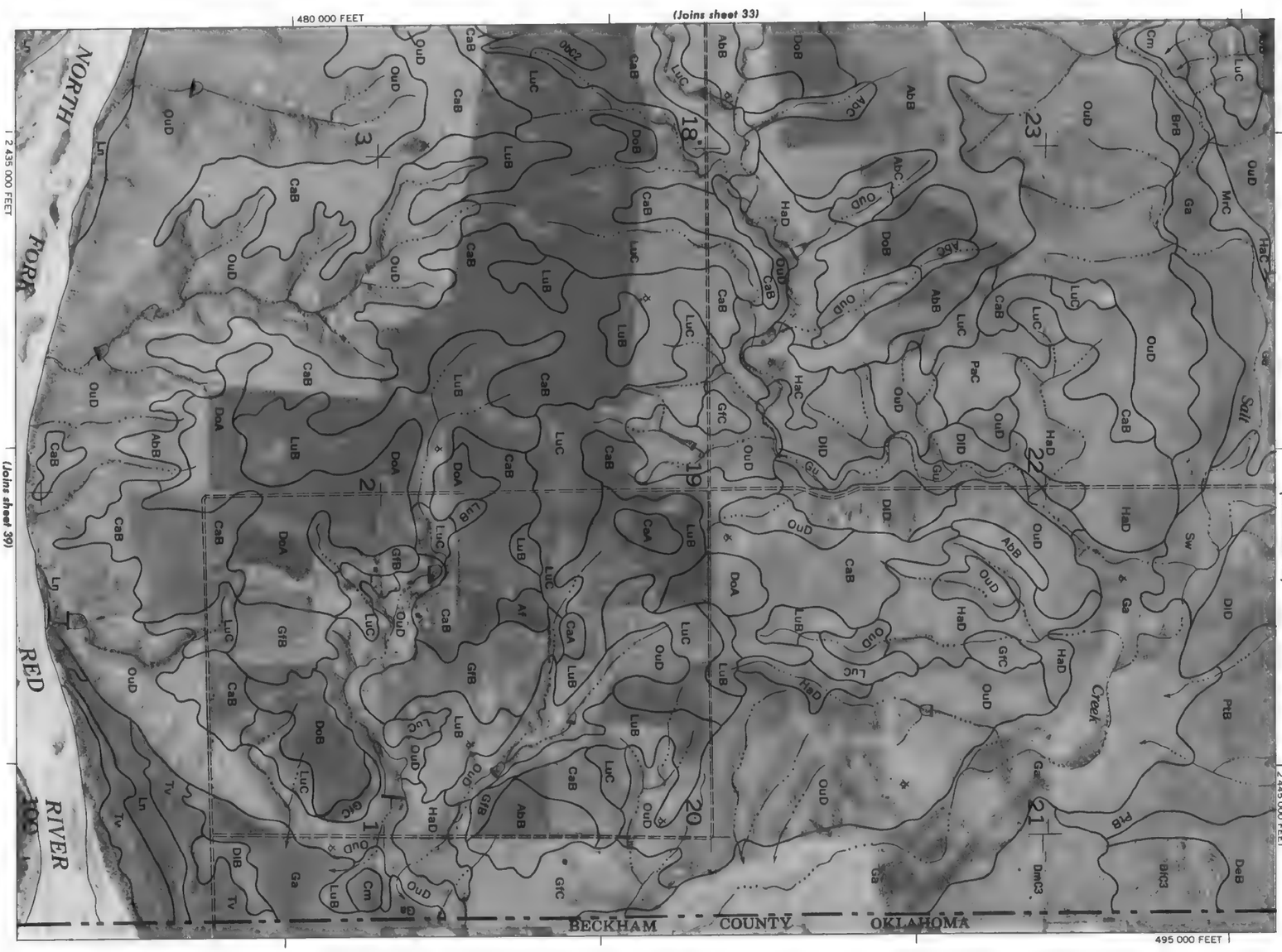
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

WHEELER COUNTY, TEXAS — SHEET NUMBER 28





Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 28

WHEELER COUNTY, TEXAS — SHEET NUMBER 29

29

N

2 290 000 FEET

490 000 FEET

(Joins sheet 23)

(Joins sheet 30)

(Joins sheet 34)

2 315 000 FEET

Hackberry Creek

Little

1443

GRAY COUNTY

Scale 1:24 000

2 Miles

10 000 Feet

5 000

475 000 FEET

WHEELER COUNTY, TEXAS NO. 29

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

30

WHEELER COUNTY, TEXAS — SHEET NUMBER 30

N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000 5 000

(Joins sheet 24)

(Joins sheet 29)

(Joins sheet 31)

(Joins sheet 35)

2 345 000 FEET

490 000 FEET

475 000 FEET

2 320 000 FEET

Sw

Land division corners are approximately positioned on this map

. Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 30

WHEELER COUNTY, TEXAS — SHEET NUMBER 31

WHEELER COUNTY, TEXAS NO. 31

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone
Land division corners are approximately positioned on this map.

2 350 000 FEET

490 000 FEET

(Joins sheet 25)

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 36)

2 375 000 FEET

1 475 000 FEET

NORTH FORK RED RIVER

Sweetwater Creek

Bronco Creek

ABANDONED RAILROAD

592

31

N

Scale 1:24 000

2 Miles 1 0

10 000 Feet 5 000 0

1 000 2 000 3 000 4 000 5 000

32

WHEELER COUNTY, TEXAS — SHEET NUMBER 32

(Joins sheet 26)

2 400 000 FEET

495 000 FEET

(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 37)

2 375 000 FEET

475 000 FEET

N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

1 5 000

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 32

WHEELER COUNTY, TEXAS NO. 33

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 405 000 FEET

495 000 FEET

(Joins sheet 27)

(Joins sheet 32)

(Joins inset, sheet 28)

(Joins sheet 38)

2 430 000 FEET

480 000 FEET

NORTH FORK RED RIVER

N

2 Miles

10 000 Feet

5 000

1

Scale 1:24 000

Land division corners are approximately positioned on this map.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid and ticks are approximate and based on the Texas coordinate system, north zone.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 34

WHEELER COUNTY, TEXAS — SHEET NUMBER 35

WHEELER COUNTY, TEXAS NO. 35

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map

35

N

2 320 000 FEET

4 70 000 FEET

(Joins sheet 34)

(Joins sheet 30)

(Joins sheet 36)

(Joins sheet 41)

2 345 000 FEET

2 Miles

10 000 Feet

5 000

Scale 1:24 000

460 000 FEET

0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

Pakan

PAKAN CEMETERY

Pumping Station

GRAVEL PIT

Sand Creek

North Long Dry Cr

126 127 128 129 130 91

109 108 107 106 105 90

100 101 102 103 104 71

83 82 81 80 79 70

GdB GdD GfB GfC HaC HaD VeC PtB DeB DfC3 DID DIB DmC3 GrD3 AbA AbB GfA GfC2 LkB Ln Tv OuD MsD PaC CaB Gu BrB ObC2 DoB LuB LuC CaB

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 31)

2 375 000 FEET

475 000 FEET

460 000 FEET

(Joins sheet 35)

(Joins sheet 37)

(Joins sheet 42)

2 350 000 FEET

NORTH FORK RED RIVER

ABANDONED RAILROAD

Cole Creek

Finley Creek

Roundup Creek

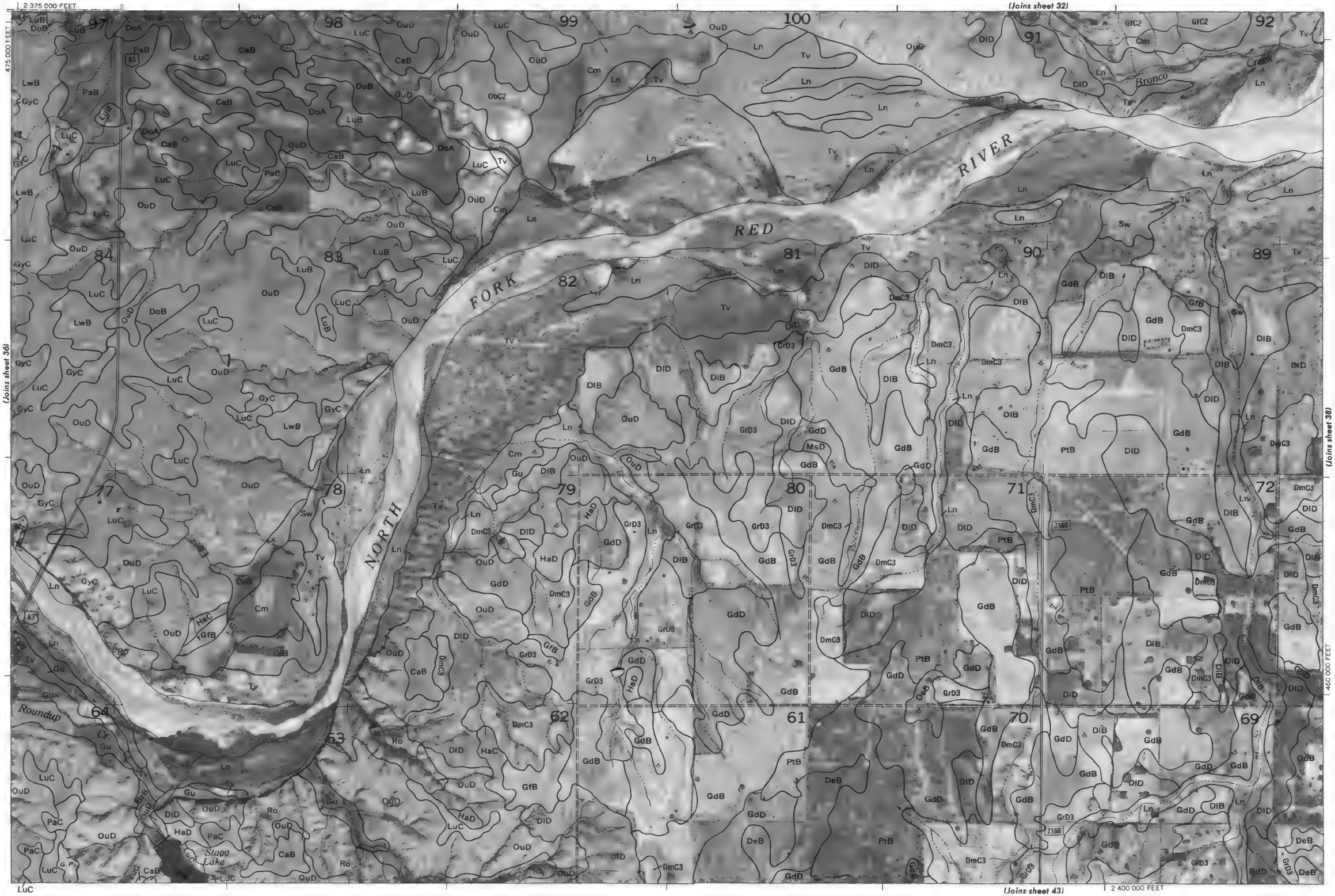
Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 36

WHEELER COUNTY, TEXAS — SHEET NUMBER 37



WHEELER COUNTY, TEXAS NO. 37

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map

38

WHEELER COUNTY, TEXAS — SHEET NUMBER 38

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0

¼ 1 000 0

½ 2 000

¾ 4 000

1 5 000

3 000

(Joins sheet 33)

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 44)

2 430 000 FEET

2 405 000 FEET

475 000 FEET

460 000 FEET

Bronco Creek

NORTH FORK RED RIVER

N FK RED R

93 94 95 96 97

88 87 86 85 84

73 74 75 76 77

68 67 66 65 64

DmC3 DIB DID GdB GdD PtB DeB Bt HaD GrD3 DfC3

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

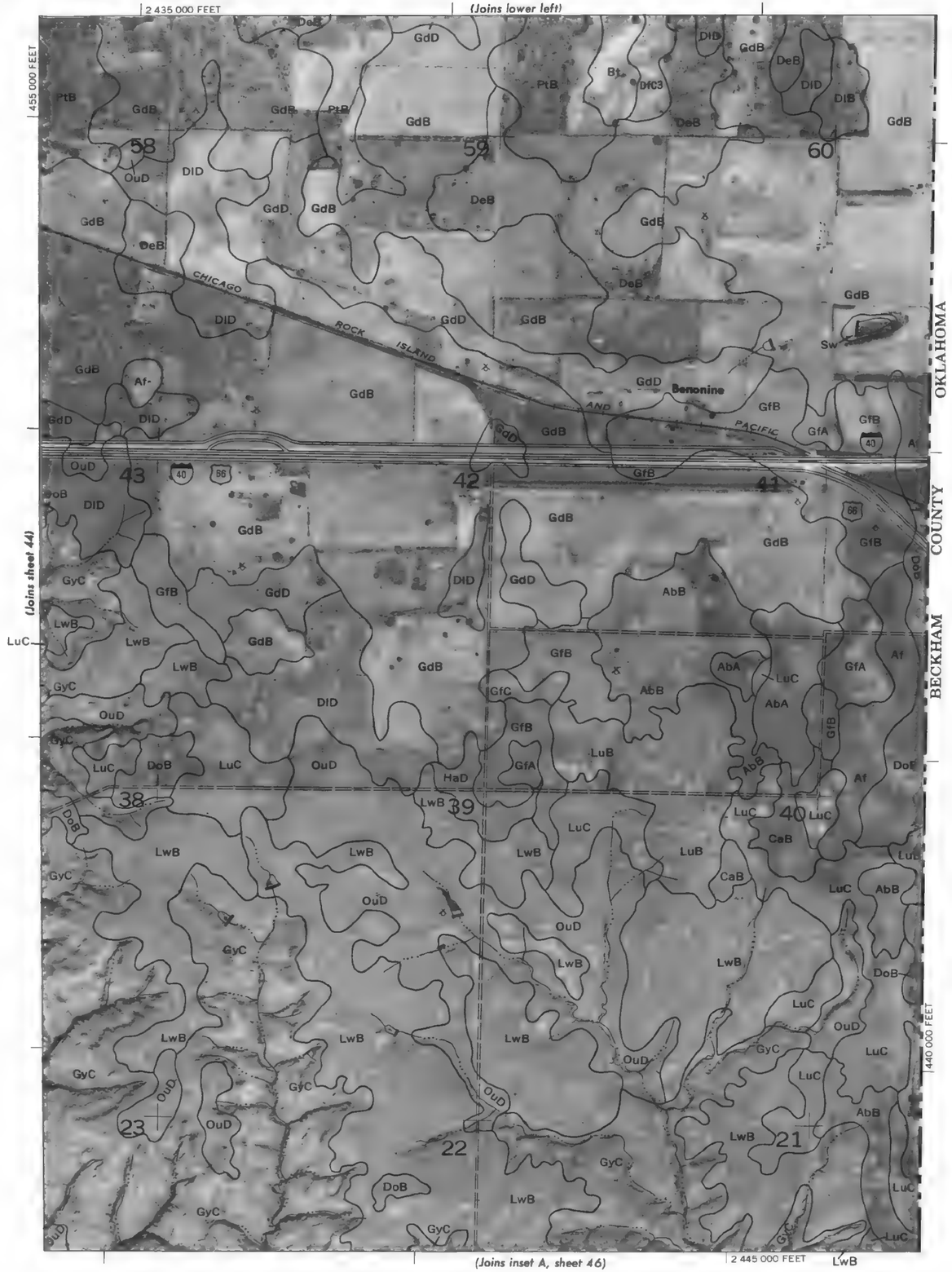
WHEELER COUNTY, TEXAS NO. 38

WHEELER COUNTY, TEXAS — SHEET NUMBER 39

39

WHEELER COUNTY, TEXAS NO. 39

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.



N

2 Miles
10 000 Feet
1
5 000
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000

Scale 1:24 000

WHEELER COUNTY, TEXAS — SHEET NUMBER 40

(40)

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 0 1/4 1 000 1/2 2 000 3/4 4 000 1 5 000

(Joins sheet 34)

2 315 000 FEET

465 000 FEET

435 000 FEET

2 290 000 FEET

(Joins sheet 45)

(Joins sheet 41)

GRAY COUNTY

WHEELER COUNTY

Previously surveyed

Boundary

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 40

Chicago, Rock Island and Pacific

Sandspur Lake

South Long Dry Creek

Ramsdell

GRAVEL PIT

69 70 71 72 73

62 61 60 59 58

43 44 45 46 47

36 35 34 33 32

GdB GdD DeB DIB DID PtB Af DfC3 GrD3 GfC GfB MrC Gu Ln Sw

WHEELER COUNTY, TEXAS — SHEET NUMBER 41

WHEELER COUNTY, TEXAS NO. 41

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map

2 320 000 FEET

455 000 FEET

(Joins sheet 35)

(Joins sheet 40)

(Joins sheet 42)

(Joins inset A, sheet 45)

2 345 000 FEET

440 000 FEET

41

N

Scale 1:24 000

2 Miles 1

10 000 Feet 5 000

0 1 000 2 000 3 000 4 000 5 000

WHEELER COUNTY, TEXAS — SHEET NUMBER 42

(42)

N

Scale 1:24 000

2 Miles 10 000 Feet

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000 5 000

2 375 000 FEET

455 000 FEET

440 000 FEET

2 350 000 FEET

(Joins sheet 36)

(Joins sheet 41)

(Joins sheet 43)

(Joins inset B, sheet 45)

SHAMROCK

INTERSTATE 40

PROPOSED

ROCK ISLAND AND PACIFIC RAILROAD

ABANDONED RAILROAD

Creek

Long

Dry

Roundup

Jr. High School

North Ward School

Golf Course

Lake

water

Land division corners are approximately positioned on this map

Photobases from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 42

WHEELER COUNTY, TEXAS — SHEET NUMBER 43

WHEELER COUNTY, TEXAS NO. 43

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.

2 380 000 FEET

455 000 FEET

(Joins sheet 37)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 46)

2 405 000 FEET

440 000 FEET

SHAMROCK

INTERSTATE 40

PROPOSED

CHICAGO ROCK ISLAND AND PACIFIC

Hackberry Creek

LuC Creek

43

N

2 Miles

10 000 Feet

Scale 1:24 000

1 5 000 0 1 000 2 000 3 000 4 000 5 000

WHEELER COUNTY, TEXAS — SHEET NUMBER 44

(Joins sheet 38)

N

Scale 1:24 000

2 Miles

10 000 Feet

(Joins sheet 43)

(Joins inset, sheet 39)

(Joins inset B, sheet 46)

Land division corners are approximately positioned on this map.

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

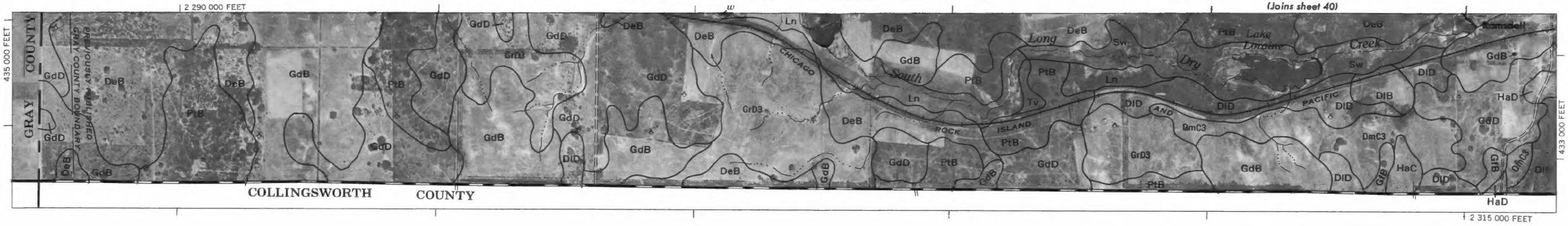
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

WHEELER COUNTY, TEXAS NO. 44

WHEELER COUNTY, TEXAS — SHEET NUMBER 45

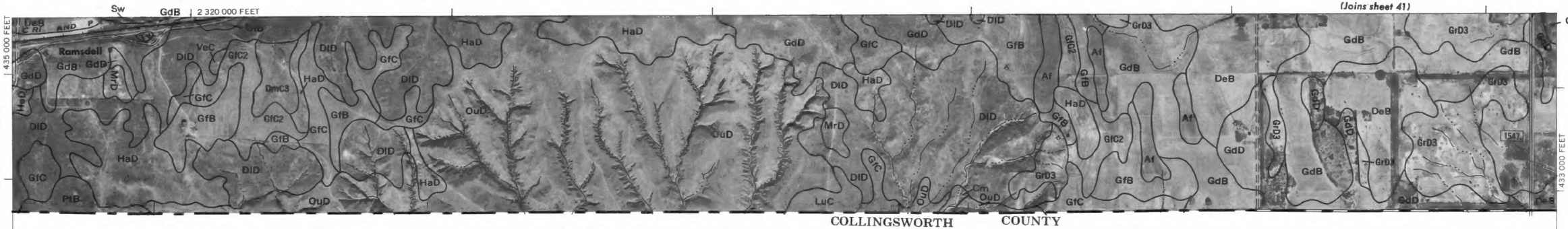
WHEELER COUNTY, TEXAS NO. 45

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.
Land division corners are approximately positioned on this map.



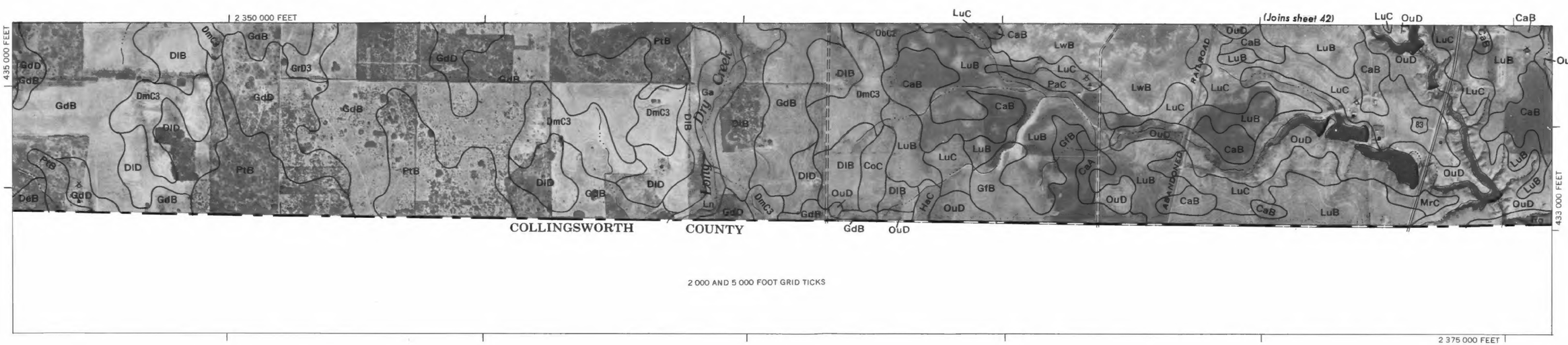
2 000 AND 5 000 FOOT GRID TICKS

INSET A



2 000 AND 5 000 FOOT GRID TICKS

INSET B



2 000 AND 5 000 FOOT GRID TICKS

45

N

2 Miles

1 10 000 Feet

Scale 1:24 000

1 5 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

WHEELER COUNTY, TEXAS — SHEET NUMBER 46

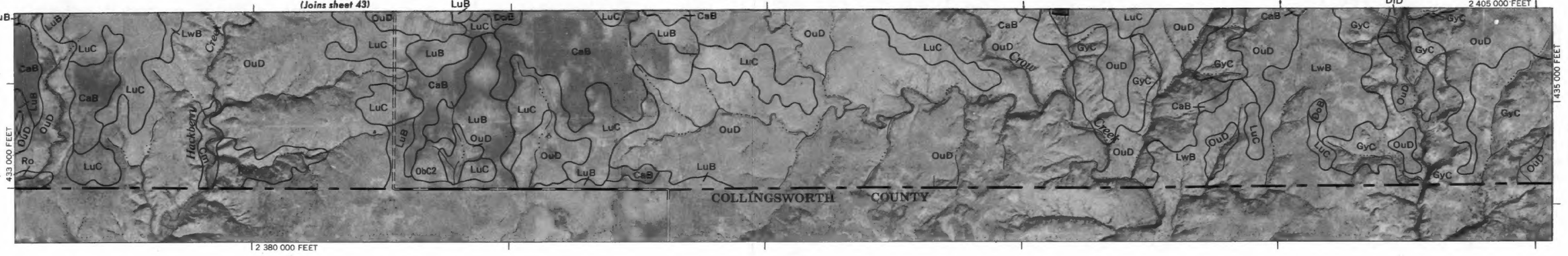
(46)

N

2 Miles
10 000 Feet
1 5 000

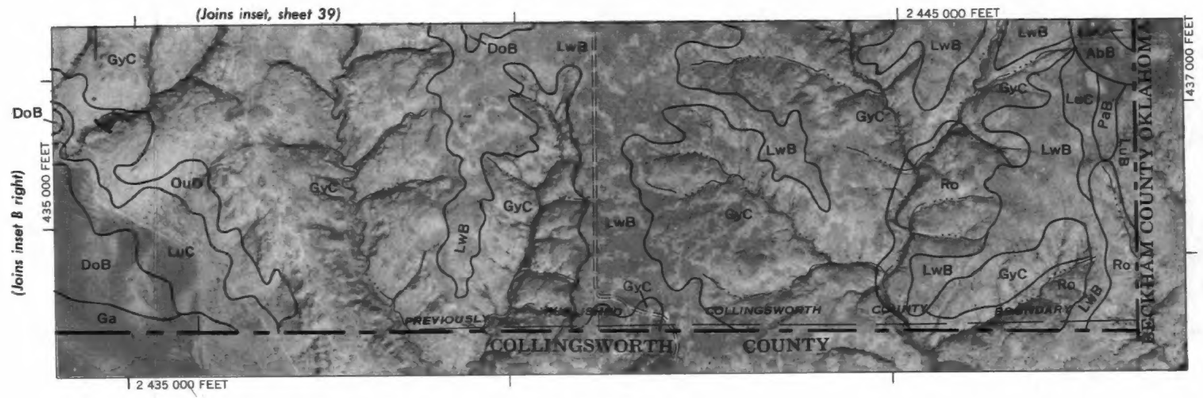
Scale 1:24 000

0 ¼ ½ ¾ 1
0 1 000 2 000 3 000 4 000 5 000



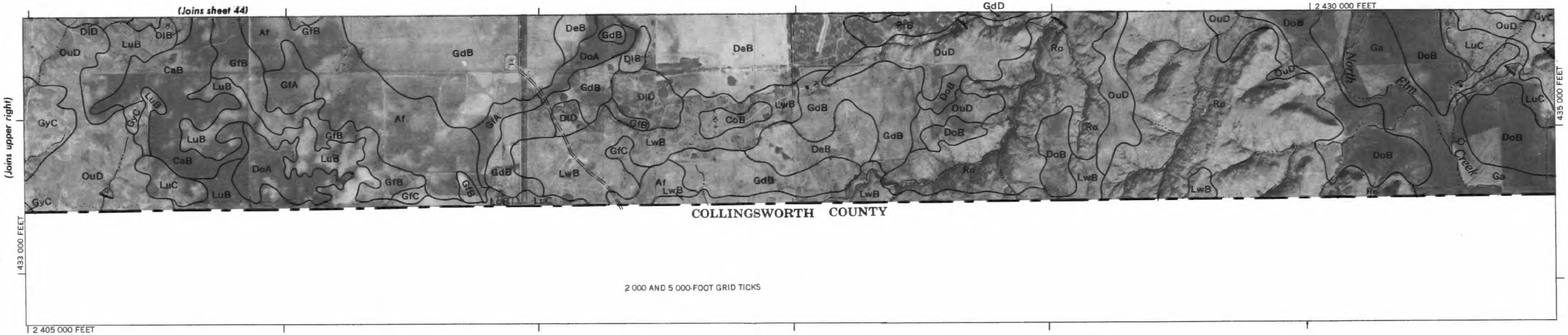
2 000 AND 5 000-FOOT GRID TICKS

INSET A



2 000 AND 5 000-FOOT GRID TICKS

INSET B



2 000 AND 5 000-FOOT GRID TICKS

Land division corners are approximately positioned on this map

Photobase from 1972 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Texas coordinate system, north zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

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